THE TEXTILE MANUFACTURER

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Notes of the Month

EMPIRE GROWN COTTONS

At the recent annual general meeting in Manchester of the Empire Cotton Growing Corporation, Lord Derby, as President of the Council reviewed the corporation's connections with Uganda, which he had recently visited. After brief mention of the work in the early years, he referred to the establishment some ten years ago of the Research Station at Namulonge and to the new and higher yielding strains bred at the station which were now in commercial use in Uganda. The station and also the other cotton growing territories in Africa and disease-resistant strains bred in Uganda were now being tested and used over a wide area. The important work on soil moisture requirements, began at Namulonge some years ago, was also beginning to have far-reaching effects.

Surveying the season's work, the annual report points out that the corporation's staff are responsible for the conduct of most of the research work on cotton in Aden, Kenya, Nigeria, Nyasaland, Tanganyika, Uganda and the West Indies in addition to being responsible for the cotton breeding work in the Republic of the Sudan. Although the production of cotton in these eight territories fell in 1957-58 by 340,000 bales to the lowest level since 1952-53, this drop was due entirely to the exceptionally unfavourable season in the Sudan. Indeed, the decrease in that territory amounted to no less than 432,000 bales, so that the other seven territories actually showed a combined increase of some 90,000 bales over the previous year. Preliminary reports indicate that the recession in 1957-58 would prove only temporary and the crops for 1958-59—from the eight territories—would attain a record of 1½ million bales. As far as individual territories were concerned, new records were attained by Tanganyika (fifth year in succession) and Nigeria, where the crop of 240,000 bales was more than 50,000 bales above the previous record crop of 1954-58 and almost 100,000 bales above that of 1956-57.

During the year the price of cotton lint fell steadily and the differentials between short, long and extra-long staples progressively diminished. This is attributed partly to the price support given by the U.S. Government to American-type cotton and partly to technical changes in demand—including the introduction of the drip-dry shirt. These shirts were made from a single coarse yarn American-type cotton instead of from a doubled yarn of fine long-stapled cotton. These circumstances had led some of the territories —particularly the Republic of the Sudan and Aden—to consider the types which will give a higher yield. In general, in cotton as with other crops, as quality was improved, yields tended to drop, so that the Departments of Agriculture, whose responsibility it was to decide on the types to be grown, had to balance price and yield in making their decision. According to the report the action by Colonial Governments some years ago in building up reserve funds to stabilise prices had undoubtedly been of benefit to the growers this season and a comparison of lint and cotton seed prices clearly revealed the comparative stability of seed cotton prices in contrast to the fluctuations that had occurred in lint prices.

Officers of the Corporation made good use of the facilities at Shirley Institute for testing new strains. The number of samples sent for small-scale spinning tests April 1958 to March 1959 actually exceeded the annual quota previously agreed upon. The most notable feature of the spinning tests was probably the poor quality shown by most of the Sudan samples, no doubt as a result of the unfavourable conditions during 1957-58. On the other hand, the Uganda samples spun yarns of good strength and appearance, being unusually free from nep. Tests on 26C selections from Northern Nigeria showed considerable range of spinning quality. Samples of possible strains for Uk58 from Tanganyika suffered from seed-coat nep, as did many of the Albar hybrids tested against Uk55 in various localities. Comparisons between I158 and 47/10 at different places in the Eastern Province indicated that I158 generally spun yarns stronger but more neppy than 47/10.

INTERNATIONAL COTTON CALIBRATION STANDARDS

A proposed expansion of the cotton calibration standards was approved by the International Cotton Calibration Standards Committee at their recent meeting in Washington. The expansion would add two calibration standards of fine cotton and one of very coarse fibres. The present programme includes three American upland cottons for calibrating test instruments—one, the Micronaire, which tests for fineness, and the other the Pressley test for fibre strength. The committee accepted a bale of Barbadense-type cotton, which has long, fine fibre, and recommended that the Cotton Division of the Agricultural Marketing Service, U.S. Department of Agriculture, obtain a bale of immature Barbadense-type cotton, also a bale of very coarse Asiatic-type cotton. These finer and coarser cottons added to the calibration standards of upland cottons now used will provide six calibration standards which will cover the full range of the Micronaire scale. The committee will also make available, through U.S.D.A., special check test cottons to be used by American cotton shippers and the International Federation of Cotton and Allied Textile Industries for determining accuracy of the testing of laboratories desiring to be designated as arbitration laboratories in international trade. Since this was started in 1956, 1,751 calibration cotton samples have been

distributed to 320 laboratories throughout the world. The number taking part in the Micronaire check test programme has increased from 110 to 187 and participation in the Pressley strength testing programme has also increased.

INTERNATIONAL COTTON POLICIES*

SINCE the 17th Plenary Meeting in London last year the cotton and allied textile industries have been in a period of recession. There are now signs of the downward movement coming to an end. An upward trend is visible here and there and business is slowly improving in various countries. Today the cotton industry hopes to be able to achieve conditions of more stable and sustained prosperity. This depends to a large extent on stability of raw cotton supplies and prices. In the reports submitted by the Secretariat we read of the great concern which governments of cotton growing countries have in regard to production, exports and prices of raw cotton. As mentioned in the Secretariat's annual review, it appears that some degree of governmental interference is unavoidable for the time being. We must, therefore, stress the responsibility which all governments have to contribute to the stability which is so vital for the whole cotton economy.

Considering the present slight improvement in the state of trade of our industry, we feel that a further co-ordination of governmental policies would be helpful. Drastic action at this stage may only lead to disturbance rather than to a restoration of confidence. It would be wrong to think, however, that no action is required in the near future. We specifically refer to the United States cotton policy. We do not wish to single out any one government; but it is a fact that the U.S. is still the leader of the world cotton economy. Every regulation adopted by the U.S. Government must therefore make a particularly strong impact.

For this reason we must call attention to the psychological effect of a small, seemingly unimportant sentence in the recent announcement of the United States Government, in which it was said that the rate of the export payment may be adjusted from time to time during the coming year. We know that this is a policy to which the U.S. Department of Agriculture is committed under present legislation, in order to safeguard the so-called fair and historical share of American cotton in the world market. Looking at the structural changes which took place in the textile industries of the world, I feel this concept of the fair and historical share in the world market may have to be given closer consideration. It is this factor of the possibility of a periodic review of the subsidy which creates uncertainty within industry. The reassurances given that no drastic action would be taken do not remove the uncertainty. We, therefore, feel that an early announcement of the amount of the subsidy, to be valid for a definite period, i.e. the coming cotton year, would help to restore confidence.

There is another aspect. Under the present two-price system, spinners cannot cover risks in the normal way. We know it is the aim of the U.S. Government to arrive at a one-price system. But we feel that further steps could be taken to speed up this programme and achieve the one-price system at the earliest opportunity. In the meantime, remedial action could be sought to facilitate proper working of futures markets and to allow spinners to cover risks. In addition to relative price stability, the actual level of raw cotton prices is a determining factor for any increase in cotton consumption, especially in the face of competition from man-made fibres. We realise, of course, that the price level of raw cotton must be such as to ensure fair return to efficient producers and to allow them to carry on their production in the future. Efficiency requirements must also be applied to industry and to the textile trade. Worthy of note in this respect is the work undertaken by the cotton industry and trade in Western Europe.

It is likely that demand would strengthen under greater price stability. The question arises whether sufficient cotton in the right qualities will then be available. We have repeatedly pointed out how cotton growing has not yet been sufficiently adapted to actual modern mill requirements. This applies particularly to long staple cottons (not extra long staple cottons), for which production still seems to be inadequate. The need to produce sufficient cotton in the right qualities becomes even more imminent in the light of recent quality deterioration. We must here express the industry's serious concern in regard to recent trends in the U.S. Present ginning methods have not been sufficiently adjusted to the new requirements created by mechanical picking. Moreover, various methods designed to obtain so-called "up-graded cotton" are detrimental to the standard of cotton in general. Although the dangers of such methods may be recognised by many, a strong warning must be voiced in this respect. The same applies to foreign matter, tar specks and other impurities prevalent in some growths other than American. Country damage and excess moisture can be found in many shipments. Bales are sometimes shoddily packed. All this causes heavy losses in the mills. Cotton growers must bear in mind that one of the chief attractions of man-made fibres is perfect evenness of quality. Cotton must therefore also remain competitive in this respect.

All these recommendations have only one aim: to further the prosperity of both growers and manufacturers. The best common efforts which they may make to achieve this aim are perhaps in market development. Results obtained so far are most encouraging. Cotton Council International is doing an outstanding job in market research and sales promotion, thus contributing to an increase in cotton consumption in general. Under their auspices ten cotton consuming countries in Western Europe and Japan are working together. In addition the Egyptian Province of the United Arab Republic and the Sudan are also supporting cotton promotion in consumer markets.

It is not our task to suggest methods of achieving co-operation between Cotton Council International, the promotional agencies in the various consumer countries and the leading cotton growers. In this respect, however, we have noted with interest the formation of the Inter-American Federation of Cotton. May we raise the question whether this organisation could join the efforts made by the cotton producers mentioned above in their useful task of cotton promotion?

The ultimate aim of all cotton growers, shippers, spinners and manufacturers alike consists of an increase in consumption. If this can be achieved, many of our problems may vanish. We have considered some ways in which this goal could be attained. They are:—

(1) Creating more stability in prices in the short run by removing all uncertainty regarding the United States export subsidy for the coming cotton year.
(2) Accelerating the measures designed to achieve a one-price system in the United States.
(3) Maintaining cotton competitive in price and quality.
(4) Stimulating consumption through joint efforts of consumers and producers.

* *From a statement on international cotton policies, which Dr. W. T. Kroese, president, presented on behalf of the International Federation of Cotton and Allied Textile Industries at the 18th Plenary Meeting of the International Cotton Advisory Committee, held recently in Washington. At this meeting, the Federation represented two-thirds of the world's cotton spindles and looms, and consumes more than 80% of the raw cotton that moves in international trade.*

Textile Mill Maintenance—I

A well-planned and organised maintenance department is usually able to forestall failure arising from wear and tear. Those due to other causes are more difficult to evade

By F. H. SLADE, A.M.I.MECH.E.

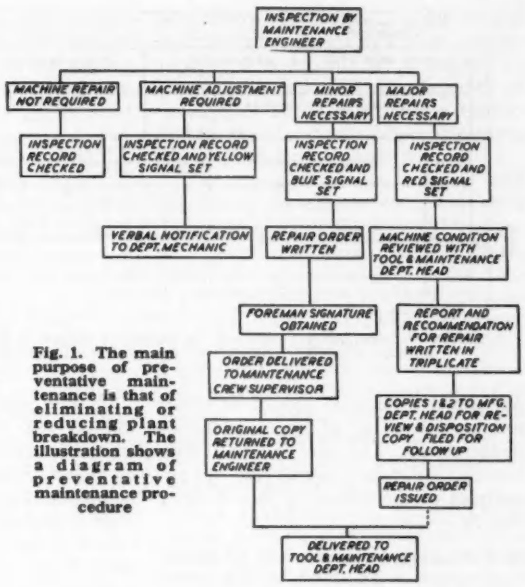

INSPECTION BY MAINTENANCE ENGINEER
MACHINE REPAIR NOT REQUIRED
MACHINE ADJUSTMENT REQUIRED
MINOR REPAIRS NECESSARY
MAJOR REPAIRS NECESSARY
INSPECTION RECORD CHECKED
INSPECTION RECORD CHECKED AND YELLOW SIGNAL SET
INSPECTION RECORD CHECKED AND BLUE SIGNAL SET
INSPECTION RECORD CHECKED AND RED SIGNAL SET
VERBAL NOTIFICATION TO DEPT. MECHANIC
REPAIR ORDER WRITTEN
MACHINE CONDITION REVIEWED WITH TOOL & MAINTENANCE DEPT. HEAD
FOREMAN SIGNATURE OBTAINED
REPORT AND RECOMMENDATION FOR REPAIR WRITTEN IN TRIPLICATE
ORDER DELIVERED TO MAINTENANCE CREW SUPERVISOR
COPIES 1 & 2 TO MFG. DEPT. HEAD FOR REVIEW & DISPOSITION COPY FILED FOR FOLLOW UP
ORIGINAL COPY RETURNED TO MAINTENANCE ENGINEER
REPAIR ORDER ISSUED
DELIVERED TO TOOL & MAINTENANCE DEPT. HEAD

Fig. 1. The main purpose of preventative maintenance is that of eliminating or reducing plant breakdown. The illustration shows a diagram of preventative maintenance procedure

THE emphasis throughout industry is on a forward surge of production; at lower cost and without detriment to quality. Competitive prices and high quality, coupled with designs that either anticipate or create demand, are the hall-marks for survival in world markets. Under these conditions the margin of profit for each unit might well be small and thus, provided markets are not saturated, high productive output must be obtained to provide reasonable overall profit. This much is essential; if investment is to be worthwhile, a good standard of living maintained—or even unemployment prevented.

To realise such a project resort must be had to high-speed processing machinery and equipment, efficient materials-handling facilities, improved factory planning methods, and improved materials and processing methods. Energy has been directed to the fulfilment of these basic requirements and it is very apparent that these endeavours will continue. It might, however, be asked whether equal attention has been given to the problem of maintaining production plant, handling equipment and other facilities in such a manner that at no time will production efficiency fall off, or breakdown of production schedules occur.

Some doubts might be entertained here and yet at no time during industrial history has there been greater need for maintenance activity and skill of the highest order. The essential design of modern production plant, with its many automatic and semi-automatic features, confirms this. The higher the speed, more precise the actions and timing and greater the output of a machine, the greater will be the need to maintain the machine to ensure its proper functioning.

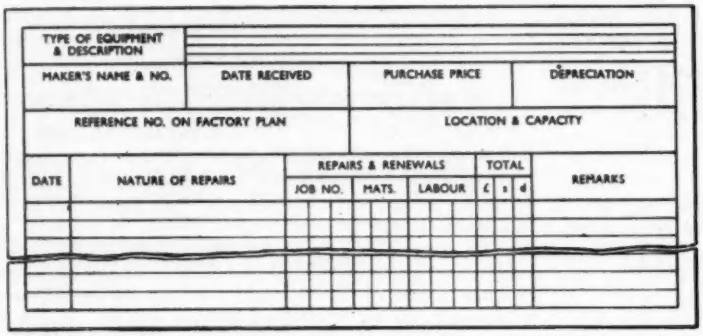
Thought may be cast a step farther than the individual piece of plant; to the fully automatic processing line, or even the automatic factory. The trend of development has been in this direction for many years and in fact, the rapid developments that have taken place in the design and control of materials-handling equipments have brought this objective very close in many industries. It means man as the controlling element and the machine as the working element. It also means the possibility of the complete stoppage in production if a single plant element should fail; for a longer or shorter period depending upon the time taken to diagnose and rectify the fault. Even to line production without full automation a simple fault can easily seriously interfere with production schedules.

This all indicates a changing vista; from the old-time millwright to the highly skilled specialist maintenance workers; from the fitter's workshop tucked away in some odd corner to the properly planned and well-equipped plant engineer's department located in a manner to give ready access to all processing sections; from a somewhat haphazard system of repairs, as and when needed, to a properly organised system of preventative maintenance. There is no doubt about these things, as they are now being implemented in many concerns. There is also every sign that, in the not too distant future, the need for skilled maintenance workers might well outstrip that for production and process workers.

Maintenance Engineering Department

The primary function of the department is, as already indicated, to ensure, in so far as is practicable that there is no interruption in production, or in the speed of production, through failure, or lowered efficiency, of machinery, equipment or engineering services. The quality of maintenance determines to a very large extent the incidence of failure, but even when this is of the highest order, stoppages occur through mishap outside the control of a plant engineer. Thus, failure may be due to unsuitable design, faulty manufacture and improper operation. A well planned and organised maintenance department is usually able to forestall failure due to normal wear and tear. Those due to other causes are more difficult to evade, even with the most rigid system of preventative inspection.

Other factors adverse to the procurement of efficient maintenance arise from the lack of proper facilities. Good maintenance cannot be expected from an under-manned engineering section, which, in so many cases, is ill-housed and inadequately tooled. As much, if



TYPE OF EQUIPMENT & DESCRIPTION			
MAKER'S NAME & NO.	DATE RECEIVED	PURCHASE PRICE	DEPRECIATION
REFERENCE NO. ON FACTORY PLAN		LOCATION & CAPACITY	

DATE	NATURE OF REPAIRS	REPAIRS & RENEWALS			TOTAL			REMARKS
		JOB NO.	MATS.	LABOUR	£	s	d	

Fig. 2. A plant record case should include a complete listing of the equipment, together with full details of all repairs effected from installation onwards

not more, attention, should be given to the planning of a maintenance department. The size of this will, however, depend upon the careful analyses of the following determining factors:—

(1) Estimate of annual cost of maintenance work done by the plant force and of the work performed on an outside contract basis.

(2) Availability of maintenance trades in the plant locality.

(3) Comparison of cost of "down time" losses in production versus the standby cost of keeping maintenance crews available for critical operations.

(4) Availability of competent personnel in the plant for direct labour maintenance work.

(5) Estimate of the amount of repetitive work in each type of maintenance trade. This forms the basis for determining the amount of justifiable direct labour maintenance in each trade.

(6) Status of labour relations in the plant, and the contingency of jurisdictional disputes.

The use of special tool kits is advised, especially if designed for labour saving, or to eliminate the dangers inherent in improvisation. The modern hand-operated hydraulic tool kits now available provide an excellent example. These comprise a universal tool which, when fitted with the appropriate accessory, can be used by one man to pull, press, lift, bend, clamp and spread—in fact, cope adequately with most of the innumerable small handling tasks which arise on the shop floor. Similar equipment, complete with work-stands, can also be obtained; these being wheel-mounted for easy transfer to and from equipment under repair. Ease of mobility of tools is important, and other examples are portable welding sets, portable pipe-threading machines, mobile tool-boxes, etc. The latter are usually mounted on a steel chassis fitted with pneumatic-tyred wheels.

Heavy components and machinery should not be manhandled, for the obvious reasons that such practice increases repair times, and in consequence loses production time, as well as the accident hazards involved. There is no dearth of handling aids, both large and small, that can be adapted for use by a maintenance section. For example, mobile cranes, mounted on the fixed platform type of battery-operated industrial truck, are found to be especially useful in the dismantling, movement and reassembly of all kinds of plant, as indeed are also fork and other types of powered mechanical handling units.

Components and sub-assemblies will, as they are stripped from plant and machinery also need to be conveyed to the maintenance workshop for reconditioning. One good method is to place the parts on to, or into stillages as soon as they are stripped down, to be conveyed, by a powered or hand-propelled elevating truck, as a unit load. Reconditioned or new parts can be brought to the plant under repair in like manner. Either platform or box stillages live (wheeled) or otherwise are employed.

The trend towards time-saving techniques is again exhibited in routine servicing such as lubrication. Here a trolley, sometimes power-driven, is provided, on which are maintained suitable containers of lubricants and greases under pressure. Servicing is in accordance with a pre-arranged schedule, and providing this is correctly followed, all operative equipment in a plant is lubricated at the right time. Where such a scheme is operated, it is usual for a record card attached to the equipment to be filled in at the time of servicing, i.e. to ensure correct frequency to application at each point indicated by the lubrication schedule.

As stated, the size of a maintenance workshop is governed by the production capacity of a factory or mill, or more exactly the amount of plant and equipment installed. If fully self-contained, the workshop should be of such proportions, and properly equipped to provide for routine servicing and maintenance, unavoidable breakdown, and the acceptance of plant at the time predetermined for overhaul. From this it can be inferred that all major overhauls to plant in a small mill are best effected by outside contract. Such a precedure incurs overheads in excess of those needed for a "home-maintained" mill, or maintained by direct labour, but it avoids the cost of expensive plant and skilled mechanics, who may not be fully employed at their trade. It does not, however, debar maintaining a workshop well-equipped for routine maintenance and light repairs.

A fully equipped workshop, and by this is meant one equipped with both machine tools and powered hand-tools, begins to be justified when a medium-sized mill is involved. The actual point at which standard and special machined tools are justified is when such factors as amortisation, space occupied, time-saving, etc., warrant the initial and operating expense incurred. Even with relatively

DAILY LIFT TRUCK REPORT

Works ..... Truck No. ..... Date .....
Engine running time per day ..... hours ..... minutes

	Total
Cost of fuel	£ .....
Cost of oil	.....
Cost of battery charge, kW hrs.	.....
Cost of labour for truck repairs : chassis	.....
Cost of labour for truck repairs : power unit	.....
Cost of parts for truck repairs : chassis	.....
Cost of parts for truck repairs : power unit	.....
Cost of labour for servicing ..... hrs. per day chassis	.....
Cost of labour for servicing ..... hrs. per day power unit	.....

(Remarks on performance, adaptability, breakage, reason major repairs were necessary, etc.)
(List all major repair parts)

Fig. 3. In this case, the truck operator compiles a report which serves as a basis for the daily operating cost record

large factories it is not usually practicable for the maintenance workshop to include specialised machinery for precision operations.

From the foregoing it will be seen that the basic concepts of workshop layout and organisation are much the same in every case, the only difference being, in the main, the amount of work which has to be placed with subcontractors. The class of mechanic employed must, of necessity vary; an all-round man is required in a small workshop, and specialist tradesmen as the size of the factory increases. This, however, does not preclude the former from the responsibility of inspection for major overhauls. If assemblies are stripped-down and sent away for repair and overhaul whilst they are still working with reasonable efficiency, the work can be carried out quickly and relatively cheaply.

System Must be Organised

No hard and fast rules can be laid down on the work involved in operating a maintenance section, as every plant is faced with its own particular problems. Maintenance can, however, be divided into four clearly defined groups. These are breakdown, scheduled, planned and full preventative maintenance. All effort, in a well organised maintenance section is directed to eliminating the need for breakdown maintenance. Should, through accident, failure occur, facilities for quick repairs will minimise stoppage. Scheduled and planned maintenance should form part of a full preventative maintenance scheme; which provides flexibility for repairs, replacement and renovation at all times, based upon constant surveillance and a careful study of case histories.

Fig. 1 illustrates a layout of preventative maintenance procedure; for pieces of operating equipment scheduled for inspection on a monthly or semi-monthly basis, depending on the potential frequency and severity of repairs. The maintenance engineer responsible for carrying out this work checks each potential trouble point on a machine inspection record sheet; kept in a loose-leaf visible binder. As inspection proceeds, each part requiring attention is indicated with a coloured signal, differing, as shown in Fig. 1, with the severity of the work involved, on the record sheet for each equipment.

When machine adjustments are required (yellow signal) the departmental mechanic is notified verbally. Minor repairs (blue signal) require the issue of a repair order and authorization of the repairs by the departmental head concerned. In the case of major repair, the condition of the machine is reviewed with the head of the tool and maintenance section. The result of this interview is written-up in a report made out in triplicate. Copies 1 and 2 go to the head of the manufacturing department in which the machine is located, and copy 3 is put in a follow-up file. The department head decides whether to repair or replace the piece of equipment and returns the form to the maintenance section with comments on the action to be taken. It therefore follows that a complete understanding of replacement studies is also necessary to effective maintenance. These will be considered later.

It will, however, be fully appreciated, from the foregoing brief notes, that preventative maintenance takes some considerable time to institute; especially in organisations where maintenance has been considered a necessary evil and not an essential part of production. Not only does it involve considerable experience of the plant in question, but a complete recording of all services, plant and machinery installed, frequency and nature of work carried out within the plant and cost and time involved in effecting this work. It is only from careful examination of past records that it is possible to estimate the periods at which a machine should be taken from production for preventative maintenance; also the amount of work required. No matter how the problem is viewed, the proper keeping of records is imperative. No organisation can expect to operate efficiently otherwise and the larger the organisation the more essential the aspect of maintenance work becomes.

Planned maintenance, a form of preventative maintenance, can be regarded as the first step in the institution of a full preventative maintenance scheme. It can operate in both small and large concerns and with the former, eliminate the disasterous effects occasioned when the man "who carries things in his head" is, for any unforetold reason, away from work.

Here, one sound method in the allocation of labour is to have it organised for group and general maintenance. The former is concerned with the servicing of plant and machinery in situ, and can be subdivided to deal with (*a*) planned maintenance, (*b*) repairs, (*c*) alterations and additions and (*d*) new construction work. The latter will deal with plant sent from the groups to the central maintenance workshops for major repairs or overhaul. It is related to group maintenance by its efficiency of service by attention to these repairs and by the speed with which it returns the machines to production.

The compilation of a plant and machinery inventory, even though a formidable undertaking, is most necessary to effective progressing of work. Once carried out and kept up to date, it provides a rapid reference facilitating the requisitioning of replacement parts. The actual location of all individual equipments should also be indicated on a plan of the factory, and related to history records. Importance is attached to keeping these plant layouts up to date, noting replacements or additions as soon as they occur.

Similar care must be accorded to all factory services if efficient operation is to result. They are perhaps even more important than production machinery and this dictum applies equally to steam, water, air, electrical and other services. For example, a fault in the electrical services on which might appear to be a comparatively minor section of the distribution system can easily result in the complete shutdown of a mill. Mill services plans are therefore required and related to the production plant serviced, so that faults may be quickly traced and, as in the case of steam mains, faulty sections isolated without the need for hunting out the requisite isolating valves. This system also insures against haphazard extensions and, in many cases, consequent overloading.

A system of this type can be applied to service equipment such as electric motors. The distribution system would, of course, be given as a general layout, and, in addition, all electric motors used would be standardised, in so far as possible. This permits drawing upon a pool when any motor of a given capacity breaks down and its eventual replacement in the pool when repairs have been effected. Complete machine records of each motor must be kept, with details not only of type, speed, capacity, location, repairs, etc., but also overall dimensions. This will facilitate immediate recognition as to whether a particular motor is suitable for fitting directly to machinery calling for replacement.

The next stage in organisation embodies flagging, on charts exposed in a prominent position, (*a*) full details of all motors in use, in stock or undergoing repairs, and (*b*) the position of all motors in use on a scale plan of the

NAME .....
CLOCK NO. ..... DATE .....
TRADE .....

ITEM	JOB NO.	EQUIPMENT	REF. NO	WORK TO BE CARRIED OUT	SPECIAL POINTS TO BE EXAMINED	TIME		REMARKS
						START	FINISH	

Fig. 4. Work card for routine maintenance and running repairs. Entries are made progressively, as each job is completed, to a planned schedule

factory. Each motor will, of course, be numbered, and these will be marked accordingly on Chart 1. Spare motors in stock, use, or undergoing repair can be shown by different coloured pins. Thus, assuming red, green and yellow are the colours used to indicate the various stages respectively, as soon as a motor is withdrawn from stock to effect replacement, it will be indicated by a green pin and the motor under repair will be shown by a yellow pin. When the repairs have been concluded, the motor automatically goes into stock and the yellow pin replaced by a red one. The green pin is also withdrawn, as the replacement motor is no longer on stores issue list. Flagging of the work plan (Chart 2) with the replacement motor number indicates its location and usage during this period. By employing this simple method, all parties concerned can see at a glance the exact position of all electrical driving units.

Adequate Records

The advantages offered by the foregoing system are readily apparent, applied thus, or to other types of machinery. In fact, economical and efficient maintenance, and certainly not preventative maintenance, is not possible unless backed by good organisation based upon adequate information. Paperwork should, however, be kept to a minimum, commensurate with the size of mill services and, wherever possible printed standard instructions should be issued for routine work. No hard and fast rules can be laid down, as each maintenance project must be assessed on its own merits, but first and foremost a record of each piece of plant is essential. This should include, as indicated in Fig. 2, a complete history of the machine in question, giving full details of all work carried out on it since installation. It is also advisable to include in this record the cost of each job completed, together with the current value factor, so that it is possible to see at once whether the plant is worth retaining in service.

Daily operating reports assist considerably in the maintenance of adequate plant records; of the type shown in Fig. 3. These are generally filled out by the operator of the equipment and are used particularly for cranes and industrial trucks. The driver may check off each item, as he inspects his machine before starting a day's work, or he may make out the report at the end of a shift. In either case, any repairs needed, or anything else that should receive additional attention will be noted.

General servicing, such as lubrication, cleaning, etc., can be recorded on cards located at each plant item, whilst routine maintenance and running repairs by the maintenance department can be recorded each day in the manner shown in Fig. 4 by the mechanic concerned. It may not, however, always be possible to allocate jobs to mechanics attached to any particular work section to effect running repairs and adjustments, as and when required. Recording in this case may be to a predetermined series of job numbers on cards from books containing up to 100 cards. As each job is completed, the work is entered

Fig. 6. Record sheet covering maintenance of an electric chain block. This not only ensures that the required service has been effected, but indicates wear and deterioration of equipment

Serial No. .....

WEEKLY MAINTENANCE RECORD SHEET

Form 4538 Commencement Date .....

Week No.	Lubrication	Chain	Limits	Springs	Brake	Hook etc.	Signature	Remarks
27								
28								
29								
30								
31								
32								
33								
34								
35								
36								
37								
38								
39								
40								
41								
42								
43								
44								
45								
46								
47								
48								
49								
50								
51								
52								

Fig. 5 (below). Unit entry card. As each job is completed, the work is entered up; one card per item

NAME .....
CLOCK NO. ..... JOB NO. .....
TRADE .....

EQUIPMENT	REF. NO.	WORK CARRIED OUT	START		FINISH		REMARKS
			DATE	TIME	DATE	TIME	

up, one card per item, and all cards used are returned to the maintenance department at the end of a day's work. A card of this type is illustrated in Fig. 5.

Another form of plant maintenance record card is shown in Fig. 6, from which it will be seen that these record cards, or sheets, can be compiled in such a manner that they conform exactly to the piece of equipment in use. The particular record sheet covers the maintenance of an electric chain block. Here it is advisable to check over the chain for damage, or wear at the seal links, every week. At the same time, lubrication should be carried out, if necessary, as should also washdown with paraffin and re-lubrication with colloidal graphite dispension, if operating under all adverse conditions. The limit trips should be checked for positioning and to see that the top and bottom limits are operating correctly.

It is then also necessary to examine the chain guards for correct tensioning —the coils should be touching when free, and to check the brake for slip. If present, readjustment should be effected. All nuts, etc., must be checked for tightness and rectified if slack, and the bottom hook and attachment examined for strain and other damage. Free rotation of the hook and sheave should be ensured, and lubricated if necessary, whilst all nipples need greasing where subject to heat.

All of the foregoing factors are, as will be seen, catered for on the record sheet, and so are also any remarks on wear and tear likely to lead to breakdowns. Other features require attention from the maintenance sections, and thus a monthly and six-monthly schedule should be included for the checking and servicing of components that are not likely to lead to rapid service failure, or do not require servicing at such frequent intervals.

Cost and Stores Records

It is most essential that a maintenance engineering department should operate on a fully commercial basis; the whole use of the department must be charged to the plant serviced and a proportion of overheads must be included in the charges booked against individual equipments and plant. Complete records of servicing, repairs, cost, etc., are therefore necessary and they serve two purposes. The first is to show whether a particular type of equipment is economical for the work on which it is used and to compare different designs on the same work.

PART NO. _____ NAME _____ BIN NO. _____

EQUIPMENTS _____ MIN. STOCK _____

ORDER QUANTITY _____

ISSUED			ON ORDER				RECD.		STOCK
JOB NO.	DATE	QTY.	QTY.	ORDER NO.	DATE	DATE DUE	DATE	QTY.	BALANCE

Fig. 7. An accurate record should be kept of all plant spares and replacements. A typical stock record card is illustrated. This ensures the availability of parts when needed

The other is to enable it to be ascertained when equipment or a machine is costing so much for upkeep that it calls for replacement.

Work's engineers usually prefer to assess their depreciation on a straight-line basis, i.e. to spread the difference between initial cost and the salvage value over a number of years in use. The proportional loss method is, however, favoured by industrial accountants, which means that in any year an equipment looses some fixed proportion of its value at the commencement of that year. This gives, when plotted, a curve instead of a straight line.

Spare parts can be stocked on a maximum and minimum basis, and withdrawn only by the engineering staff who are responsible for advising the storeman on adjustments to the stock limits, according to the time required to make replacements, and on the sizes to be kept in stock; these may vary as the plant wears. An elaborate recording system is not required, and record cards of the type shown in Fig. 7 are adequate.

Another point to be emphasised is that it is not necessary, whatever the size of the factory, that the quantity of stores carried in stock should bear any proportionate relationship to the number of process machines installed. In fact, the quantity of stores in all cases should be the minimum possible. It is governed by breakdown frequency, which is low where preventative maintenance is adopted, and the overriding consideration that sufficient parts and materials must be available when needed.

(*To be continued*)

TECHNICAL INFORMATION— DYESTUFFS, etc.

The technical information sheets listed below have been recently issued by I.C.I. Ltd., Dyestuffs Division:—

No. 402. Procion and Procion "H" Dyestuffs: Standardisation of Printing Recipes.

No. 403. Procion Dyestuffs: Continuous Dyeing of Cellulosic Loose Fibre and Yarns.

No. 404. Procion and Procion "H" Dyestuffs: Fixation of Prints by Dry Heat Treatment.

No. 428. Procion Dyestuffs: Application to Wool.

No. 437. Procion Dyestuffs: Recommendations for Washing-off Printed Patterns.

No. 442. Wet Fastness Properties of Procion Dyeings.

No. 443. Procion Dyestuffs: Use of Fixanol PN in Printing.

No. 445. Identification of Procion Dyestuffs on Cellulosic Fibres.

No. 452. Application of Procion Dyestuffs to Natural Silk: Supplement No. 1— Fastness to Printing.

No. 464. Emulsion Thickenings in Textile Printing.

No. 472. Dyeing "Terylene"/Cellulosic Fibre Unions.

No. 473. The Light Fastness of Dyestuffs.

No. 475. Lubrol TW: Scouring Assistant and Anti-Static Agent for Use in Worsted System Processing.

No. 477. Carbolan and Coomassie Dyestuffs: Application to Wool by the Carbolan Salt A Method.

AUXILIARY PRODUCTS

I.C.I. Ltd., Dyestuffs Division.

Pamphlet No. 89. Fluolite C—A fluorescent whitening agent.

Pamphlet No. 110. Cirrasol FP—A fibre processing and textile finishing aid.

Pamphlet No. 113. Cirrasol AC—A finishing agent for a wide range of fabrics.

Technical Circular No. 26. Textile Processing Aids. Agents for wetting, lubricating, anti-static, sizing, etc., purposes.

PUBLICATIONS

I.C.I. Ltd., Dyestuffs Division.

Reactive Dyestuffs—A New Method of Approach to Dyeing.

Some Chemical Foundations of Fast Colour Printing.

SC 830. Duranol Direct Black T. A disperse dyestuff recommended for dyeing "Terylene," etc. fibres.

Trade Literature

"POLYCELL" PACKAGING. "Polycell" polythene-coated cellulose film has considerably increased the scope of transparent flexible packaging. It adds the sparkle of cellulose film to the inherent low-temperature flexibility of polythene, providing a film with good physical and mechanical properties. In a handbook released by British Cellophane Ltd., Henrietta House, 9 Henrietta Place, London, W.1, the properties of this versatile film are described and some uses are suggested. These include heavy duty packaging in textiles.

* * *

DEGREASING PLANT. A leaflet from I.C.I. Ltd., Imperial Chemical House, Millbank, London, S.W.1, introduces a new standard range of totally enclosed, semi-automatic trichloroethylene degreasing plant. The plant uses non-inflammable trichloroethylene; one of the most powerful grease solvents known, and is in two sections: a removable upper section which carries the conveyor mechanisms, and a lower section containing the process compartments, heating equipment, and water-cooled coils for condensing the vapour. I.C.I. have been manufacturing similar plants for thirty years and their accumulated experience is at the disposal of anyone with a degreasing problem.

* * *

TEMPERATURE MEASUREMENT. George Kent Ltd., Luton, Beds, have released Publication T.P.5039, entitled "Primary Elements for Temperature Measurement," the release takes the form of a paper written by Mr. H. G. Oughton, Technical Director, Foster Instrument Co. Ltd., Letchworth, Herts. The Paper is divided into three main sections dealing respectively with resistance-thermometer elements, thermocouples, and radiation pyrometers. Consideration is given to the principles, construction, and performance features of each type of element, with special reference to applicational technique.

* * *

HIDUMINIUM PRESSURE DIE CASTING. An illustrated folder from High Duty Alloys Ltd., Slough, Bucks, explains how by close liaison with the company's technicians at the design stage, manufacturers in all spheres of industry can secure components of intricate design produced to great accuracy. This close co-operation is claimed to reduce further costs to a minimum. The leaflet also gives full details and specifications for Hiduminium 00 and 10.

* * *

MICRO SWITCH SELECTION. Micro switch usage has increased with remarkable rapidity in recent years, and yet, in spite of their justifiable popularity very little has been written about them. Burgess Products Co. Ltd., Micro Switch Division, Team Valley, Gateshead, have therefore instigated a valuable information service for users, with their attractively styled periodical—"Micro Switchcraft." The fourth issue of this excellent little work is devoted to an eleven page article on micro switch selection. Sections dealing with the choice of switch contacts and the correct setting-up of the switch on application will be of special interest to the practical engineer.

ELECTRONIC PROCESS TIMERS. Elcontrol Ltd., Willbury Way, Hitchin, Herts, have issued a revised data sheet T.R. issue 2, describing their range of electronic process timers, cyclic timers and delay switches. Descriptions of the three types of timer have been simplified and information regarding their characteristics has been presented in tabular form.

* * *

ENGLISH ELECTRIC PUBLICATIONS. The English Electric Co. Ltd., Publicity Dept., Foregate Street Offices, Stafford, announce the availability of four new publications. They are: SG/251, a six-colour publication describing the frame "9" air blast circuit-breakers. ST/117, describing non-reheat steam turbines of 10 M.W. ratings and above. Details of manufacture are illustrated together with installations varying from 10 M.W. to 100 M.W. units. ST/121, a twelve-page catalogue concerning geared steam turbo-generating sets of the condenser type, with outputs from 750 kW to 5,000 kW. And WA/141, a four-page leaflet dealing with the "Hermees" electrode for faster welding of heavy sections and restrained joints in mild steel, medium high tensile, and carbon and alloy steel.

* * *

WIGGIN NICKEL ALLOYS. The fiftieth special edition of this widely read company journal is packed with colour and black and white half-tone illustrations and departs from the usual practice of publishing articles describing specific uses of Wiggin Alloys. Instead the theme of this issue is the scope of the organisation, its products and their properties, and the wide range of uses to which they are put throughout industry. Copies are available from Henry Wiggins and Co. Ltd., Thames House, Millbank, London, S.W.1.

* * *

BUTTERFIELD NEWS. Several well-written articles are included in the latest edition of this lively house magazine. Those of particular interest are "Lining Tanks with Epoxy Resin Based Paints," "Welding Technology," and "Radio Controls our Internal Transport."

* * *

DU PONT MAGAZINE. "The science of packaging industrial products is beginning at last to catch up with the science of producing them." This statement introduces an interesting article by Mr. G. H. Kester in a recent edition of this well-known publication. The article describes and illustrates the "Scaldbulk" system of materials handling. Copies available from the Editor, "Du Pont Magazine," Wilmington 98, Del., U.S.A.

* * *

CRABTREE CLOSEGANG ASSEMBLIES. The Crabtree "Closegang" range embraces high-efficiency accessories designed for "closegang" mounting. Details and specifications of these units are set out in an informative illustrated booklet available from J. A. Crabtree and Co. Ltd., Lincoln Works, Walsall, Staffs. The range of 1 to 12 gang assemblies uses only four standard steel boxes.

NEGRETTI AND ZAMBRA OVERSEAS. Negretti and Zambra Ltd., 122 Regent Street, London, W.1. The company's connections, sales and service facilities, and addresses overseas are listed in a booklet entitled "Sales and Service Overseas," available from the above address.

* * *

MOTOR CONTROL CENTRES. Igranic Electric Co. Ltd., Bedford, have recently released an informative publication describing their newest advance in the control field—extensible control centres containing withdrawable panels. Centralised control gear is said to be possible in the company's motor control centres, which are claimed to cut installation time, to save space and to ease inspection and routine maintenance to a marked degree. Different types of control gear can be accommodated in standard housings, allowing modifications and extensions to be made swiftly and smoothly.

* * *

BAILEY'S TECHNICAL DICTIONARIES. Several items of considerable textile importance are listed in the latest Technical Dictionary Catalogue published by Bailey Bros. and Swinfen Ltd., Hyde House, West Central Street, London, W.C.1. They include: "Modern Textile Dictionary," "Schlomann's Illustrated Technical Dictionaries," "Textile Dictionary, Vols. 3 and 4," and "Technical Dictionary for Textile Trades."

Boucle Coatings

Reproduced approximately one-quarter size, linear, the patterns displayed on the facing page are eight from the range manufactured by Keddie, Gordon and Co. Ltd., Rosebank Mills, Galashiels, Scotland. In every respect—weave, colour, texture and finish—these fabrics are superb. Brief details are as follows:—

(1) 5387. Coloured boucle and thick yarns on woollen ground. Four colours are employed in this 19 ozs. cloth—black, slate, bright blue and bottle green.

(2) 4757. A two-coloured—pink and canary—kempy knop effect on a slate and black woollen ground; it is a firmly set 20 ozs. cloth.

(3) 4963. Boucle yarn warp and thick twist yarn weft floating on single woollen yarn ground. In this 17 ozs. cloth two shades of grey (light and medium), light yellow and oatmeal are combined in an extremely effective manner.

(4) 4951. Boucle yarn checks on diagonal weave. It is a 17-18 ozs. cloth in which soft shades are perfectly harmonised. The pastel tones are pink, fawn, grey, brown, and white.

(5) 5218. A 20 ozs. raised mohair check on woollen ground. The effect of this raising on the black and white check imparts a remarkable shaded effect.

(6) 5363. Another 20 ozs. cloth featuring boucle yarn checks on kempy woollen check ground. Moss green, crimson, black and brown are the colours used.

(7) 5269. Worsted and boucle yarns on overall plain cloth effect. Chocolate, white and black across black gives this special character and balance.

(8) 5409. In this 16 ozs. cloth, boucle and thick yarns are floated on the woollen ground. A very novel, waved effect is achieved. Soft, lustrous, white yarns with light blue and light green in alternate order complete the effect.

Uses and Development of "Tricel" Staple*

Opening, blending and carding techniques on the woollen and worsted spinning systems, also factors to be considered in designing and weaving blends

By J. SMITHIES, A.T.I. and J. M. CYSARY, A.T.I.†

"TRICEL" is soft in handle and has good draping properties which make it suitable for blending advantageously with natural and other man-made fibres. The tensile properties of "Tricel" are similar to those of secondary acetate and are high enough to meet the wide range of textile needs already met by wool and the available range of rayons. Cellulose tri-acetate is highly resistant to wrinkling, creasing and wet processing, and like some of the fully synthetic fibres may be treated at temperatures higher than 100°C. owing to its high melting point. The quick drying properties of "Tricel," due to its low water inhibition, make possible the production of "wash and wear" garments which need little or no ironing. Its thermal properties allow durable pleating, heat setting and the production of embossed effects. "Tricel" dyes readily with disperse dyes, more rapidly than polyester and certain of the acrylic fibres. "Tricel" yarns and fabrics are not attacked by insects and larvae which commonly attack textile fibres and they do not yellow on prolonged exposure to sunlight. Triacetate, therefore, has many of the properties of the fully synthetic fibres, while its price is very much lower than that of the synthetics at present on the market.

In blends with "Fibro" or cotton, "Tricel" may be used for dresses, blouses, skirts, shirts and pyjamas in various weights and weaves, and for knitted dresses and underwear. With wool, "Tricel" can be used for skirts, dress shirting and suitings. For heavy duty wear, such as slacks, gym slips and men's suitings a triple blend consisting of 55% "Tricel," 30% "Fibro," 15% nylon, cotton or flax spun, or 55% "Tricel," 30% wool 64's, and 15% nylon is recommended. "Tricel"-filled bed quilts have found a ready acceptance by the consumer, owing to their dimensional stability and resilience-retention on repeated washings. In the industrial fabrics field, "Tricel" is being used for electrical insulation because of its very high electrical resistance. It is also being used increasingly in laundries and wherever high resistance to hot, humid conditions and bacterial attack are required.

* *From a paper given recently to the Huddersfield Section of the Textile Institute.*

† *Trade Development Dept., Marketing Division, Courtaulds Ltd.*

Table 1

Type	Staple Length 2 ins.	Staple Length 2½ ins.	"Tricel-Duracol" colours
(a) Standard "Tricel" ..			Tartan Red
3·0 den.	—	—	Nigger Brown
4·5 den.	—	—	MacLeod Yellow
			Shamrock Green
			Mid-Grey
(b) "Tricel-Duracol" ..	—	—	Spectrum Blue
			Navy Blue
			Black

"Tricel" on the Woollen System

"Tricel" is produced in a wide range of deniers and staple lengths to suit particular end uses. The "Tricel" range, suitable for woollen processing, includes a number of "Tricel" Duracol types shown below in Table 1.

As "Tricel" is a hydrophobic fibre, the application of neat oil is preferable in the case of blends consisting of a major proportion of "Tricel." With neat oil an application of 7 - 10% should be sufficient. When an emulsion is applied, then 10 - 14% of a 50/50% oil/water emulsion (i.e. 5 - 7% oil) can be used with good results, particularly on the finer yarns. There is still widespread feeling that man-made fibres should not have oil applied to them directly. In some cases this may be a wise precaution, but experience has shown that provided "Tricel" is not saturated with oil, there is no reason why it should not be oiled directly. This simplifies oiling where continuous blending systems are in use.

"Tricel" opens without difficulty and the treatment accorded the blend will be governed primarily by the degree of mixing required rather than by difficulties experienced in reducing the material to a suitably open condition. Where rotary blending systems are installed, this will present no difficulty, as the degree of mixing is independent of opening treatment and all the mixing required can be obtained without resorting to extra working. On the other hand, where extra mixing is dependent on extra passages through the fearnought, the following recommendations may be helpful.

For blends of mixed deniers of "Tricel" or binary fibre blends, two passages will be necessary while for colour mixtures or other complicated blends, three passages may be required.

In carding, especially in blends with wool, "Tricel" can be processed without difficulty on the woollen system and only minor modifications will be necessary.

Compared with the polyamide, polyester and acrylic fibres, "Tricel" is not a strong fibre. It has a tenacity similar to that of wool, i.e. approximately 1·2 - 1·4 gms./denier (when dry) and given proper treatment, will produce a perfectly satisfactory commercial yarn within reasonable count limits. For best results a good quality wool (60's - 64's) should be used and the addition to the blend of 5 - 10% of nylon staple is recommended particularly when finer counts are being spun. To ensure durable pleating the blend should contain at least 60% "Tricel."

The figures, given in Table 2, were compiled from a number of tests, and illustrate some results obtained with "Tricel" under ordinary commercial conditions.

Carding

Although "Tricel" is a fibre of low moisture regain there should be no difficulties arising from "static" as it is treated with an "anti-static" dressing which was proved most efficient under a very wide range of processing conditions. During carding it may be necessary to

Table 2

Blend	Approx. Count (Y.S.W.)	T.P.I.	Single Thread (gms.)	Yarn Characteristics: Grms/den.	% Extension at break
A. 100%, 3·0 den., 2 ins., "Tricel"	25½	8·6	412	0·58	14·6
B. 60% 3·0 den., 2 ins., "Tricel" 40% depitched, carb. noil	26½	9·1	254	0·39	9·4
C. 60% 3·0 den., 2 ins., "Tricel-Duracol" 30%, 60's/64's wool 10%, 3 den., 2½ ins. nylon	31	10·0	255	0·47	12·5

Notes: 1. Yarns A and B are considered to be commercially unacceptable.
2. The admixture of nylon in yarn C enables counts of 28 - 31's Y.S.W. to be spun.

Table 3
Comparison of yarns spun from 3·0 den. 2 ins. "Tricel"

Peralta	Approx. Count (Y.S.W.)	T.P.I.	Breaking Load: Single Thread (gms.)	Gms./ den.	% Extension at Break
(a) In position .. .. .. (Recorded pressure + 100 lbs.)	24½	7·3	298	0·40	9·9
(b) Lifted clear	25½	7·6	412	0·58	14·6

reduce the fancy speed particularly at the carder, in order to avoid excessive "fly." The amount of "fly" generally is higher than for wool, but is typical for acetate materials. Worker settings will depend to some extent on the type of wool being used but generally speaking, settings of 26's S.W.G. at the scribbler and 28's at the carder give good results with both 3·0 and 4·5 denier material. "Tricel" should not be overworked and a 2-part set, with not more than 2 swifts per part is quite sufficient.

As "Tricel" is sensitive to heavy pressures, the use of Peralta rollers should be avoided on blends in which "Tricel" represents the major constituent. In fact where "Tricel" blends are processed on sets fitted with Peralta rollers it is recommended to lift the top roller clear, rather than merely release the pressure.

The yarn figures given in Table 3 show the effect of running 100% "Tricel" between Peralta rollers when the recorded pressure was reduced to 100 lbs. or merely "self-weighted" as opposed to having the rollers lifted clear. Thus by lifting the top Peralta roller clear, the following improvements were obtained.

	Increase	
(1) Av. fibre length ..	56%	(approx.)
(2) Tenacity	45%	,,
(3) Extension ..	47·4%	,,

So far, most "Tricel" blend yarns produced on the woollen system have been mule spun, but it has been established that such blends spin quite satisfactorily on the ringframe. Being crimped to suit the particular spinning system "Tricel" staple possesses sufficient cohesion to make major adjustments in spinning unnecessary. A draft of 1·3 is normally recommended.

Worsted System

"Tricel" staple is available for worsted processing in 4·5 den. 5 ins. and 3 denier 4 ins. fibre dimensions, and a range of "Tricel-Duracol" (spun dyed) colours is also being produced in 4·5 den. 5 ins. staple. The preparation of "Tricel"/wool blends takes place at the top stage. Using Noble or rectilinear combs, "Tricel" can be prepared under conditions similar to those for processing "Celafibre." Using 100% top, blending may be carried out by either of two methods commonly practised in the trade, namely:—

(1) Combing blending (i.e. recombing).
(2) Gilling prior to drawing.

Where slubbing-dyed mixture shades are required, the former method is essential, but if the product is to be solid dyed in yarn or fabric form, then the latter method will be quite satisfactory.

When blended with wool, "Tricel"/wool blends may be processed on ordinary open drawing sets with very little change from normal all-wool practice as illustrated in Table 4, when producing 3 drms./40 yds. roving from 100% 64's A. Australian oil combed top and a 60/40% 3·0 den. 4 ins. staple "Tricel"/64's A. Australian oil combed top.

It will be seen from Table 4 that the only difference in the processing details is the reduction in twist at various stages in the sequence—the twist content being inversely proportional to the twist wheel number. These rovings were later spun to 1/36's on the same cap frame, spindle speed 6,000 r.p.m. with the results shown in Table 5.

In determining the yarn count, the wool was regarded as having a regain of 18·25% and the "Tricel" as having a regain of 4·5%. This means that the blend yarn is heavier in terms of dry weight per unit length than the all-wool yarn. This factor should be remembered when examining Table 5. Nevertheless, in respect of strength, spinnability and regularity the 60/40% "Tricel"/wool yarn compares very favourably with the all-wool yarn.

Table 5
Comparison of 100% Wool and 60/40% "Tricel"/Wool 1/36's Worsted Yarns

Lot	Breaking Load: Mean (ozs.)	C.V. %	Extension: Mean %	C.V. %	Irregularity (Uster) C.V. %	End Breaks 100 Spindle hrs.
100% 64's A wool ..	4·32	18·8	6·9	38·7	19·3	1·9
60/40% "Tricel"/wool	4·96	13·2	6·9	21·6	18·2	0·9

Weaving and Designing in Blends

Yarn preparation and weaving of "Tricel" and wool blends can be successfully carried out on existing machinery; no difficulties should arise and, consequently, special modifications to processing equipment have not been found necessary. It must be noted, however, that although the weaving strength of yarns containing a major percentage of "Tricel" is comparable to all-wool yarns of similar yarn count, their extensibility is perhaps a little lower. Yarns in "Tricel" and wool blends spun on the woollen and worsted systems do not need sizing. One of the major outlets for "Tricel" staple is in blends of 67% 3 or 4½ den. 2½ ins. "Tricel" semi-dull with 33% 3 denier 2½ ins. bright "Fibro," Tanguis, or Egyptian cotton, in yarns spun on the cotton system, the fabrics are usually plain weave, 1/12's c.c. with 58 ends and 40 p.p.i. in loom. 62 ends × 42 picks per inch finished.

The attractive appearance and serviceable nature of the "Tricel" and "Fibro" or cotton blended skirts has resulted in their wide commercial acceptance by the producer and consumer. Recently, however, a considerable amount of development has been carried out on blends of "Tricel" and wool spun on both the worsted and woollen systems giving heavier, fuller handling fabrics which cannot be produced on cotton machinery. It is interesting to note that when "Tricel" is blended with the coarser qualities of wool, such as 56's, it produces a softer, smoother fabric handle normally associated with finer wool qualities. In order to obtain a good degree of durable pleat retention during the normal life and repeated washings of the garment, blends of 60% "Tricel" with 40% wool are recommended in the case of worsted-spun fabrics, and 60% "Tricel" 30% wool with an admixture of 10% nylon on the woollen system. The nylon is used as a fine count spinning assistant, rather than to impart a greater degree of abrasion resistance which, provided suitable cloth constructions are used, is satisfactory with 60/40% "Tricel"/wool blends for pleated skirt fabrics.

With worsted spun men's trouserings, satisfactory 55/45% "Tricel"/wool fabrics have been produced commercially, although it is considered that an admixture of 15% nylon staple to give a 55% "Tricel" and 30% wool blend imparts an improved abrasion resistance. The abrasion resistance, particularly under critical damp conditions is then at least equal to that of a comparative firmly set 64's quality all wool/worsted trousering. This has been demonstrated by a series of comparative abrasion tests on 2 × 2 twill trouserings in 2/32's w.c. using 60 ends × 58 picks in loom respectively, where both the all-wool and the triple component "Tricel"/wool/nylon fabrics have withstood 60,000 rubs on the Martindale abrasion tester. As far as pilling is concerned, a wide range of fabrics in blends of "Tricel" and wool has been produced experimentally and commercially both on the woollen and worsted systems and no evidence of pilling has been produced, provided suitable yarn and cloth constructions have been used. In "Tricel"/wool blends, where a minor percentage of nylon staple is used either as a spinning assistant or in order to improve resistance to abrasion in the resultant fabric, care must be taken to use a sufficiently high twist factor.

The crease-recovery of well constructed "Tricel"/wool blend fabrics is of a similar or slightly improved order to that of 100% wool cloths and the advantage of high resistance to creasing at high humidities is noteworthy, making "Tricel" a very useful fibre for every kind of climate. When designing fabrics in blends of "Tricel" and wool, e.g. 60/40% respectively, the warp and weft cloth construction should be calculated at 5% less than the theoretical maximum ends and picks in the loom for all-wool fabrics. Reed width should, however, be 2 - 4 ins. narrower than is usual for all-wool settings in order to compensate for a lower degree of fabric shrinkage in finishing.

Table 6 shows typical cloth settings for "Tricel" and wool blend fabrics, found satisfactory commercially following wear trials.

A worsted spun 60/40% "Tricel" and wool blend is eminently suitable for necktie fabrics which are washable, wrinkle, and shrink resistant and have considerable crease-shedding properties. Prolonged wear trials have shown that durability is excellent provided a suitable washable interlining is employed. Interesting fashion

Table 4
Details of Worsted Drawing for a 60/40% "Tricel"/Wool Blend

Machine	100% wool Doublings	Weight drs./40 yds.	Ratch	Twist Wheel	60/40% "Tricel"/wool Blend Doublings	Weight	Ratch	Twist Wheel
Can gill ..	6	264	—	—	6	285	—	—
Sp. gill	4	180	—	—	4	180	—	—
Dram box ..	4	120	8½ ins.	51	4	120	9½ ins.	51
1st finisher ..	3	60	8 ,,	38	3	59	8 ,,	47
2nd finisher ..	3	30	7½ ,,	40	3	28	7½ ,,	40
Reducer ..	2	9	7½ ,,	62	2	9	7½ ,,	74
Rover	2	3	6½ ,,	42	2	3	6½ ,,	49

Table 6
"Tricel"/Wool Fabrics

Count of Yarn	Yarn Composition	End and Picks per inch in Loom	Weave	Fabric End Use
2/32's w.c.	50% 4½ den. 5 ins. "Tricel" 40% 64's wool	60 × 58	2 × 2 twill	Skirts
2/30's w.c.	60% 4½ den. 5 ins. "Tricel" 40% 64's wool	40 × 42	Plain	Skirts and ties
2/32's w.c.	55% 4½ den. 5 ins. "Tricel" 30% 60's wool 15% 3 den. 4 ins. nylon	60 × 58	2 × 2 twill	Men's trousering
3½ Yk. Sk.	60% 3 den. 2 ins. "Tricel" 30% 64's wool 10% 3 den. 2½ ins. nylon	42 × 40	2 × 2 twill	Skirts

fabrics can be produced using "Tricel"/wool blend yarns in weft across filament "Tricel" warps, for instance, in a weft sateen weave construction. The combination of "Tricel" filament and blended yarns in such fabric construction ensures that the properties of the "Tricel" fibre such as an attractive appearance, drape, pleasant handle, resistance to creasing combined with ease of washing, quick-drying, and shape retention are fully imparted to the cloth and made-up garment. The excellent washability of "Tricel" and wool-blended yarns can be used to advantage in knitting yarns for underwear and outerwear.

The range of "Tricel-Duracol" fibres increases even further the designer's scope in the production of tartans, checks, and tone-in-tone effects at a more economical price than stock or piece dyeing the white fibre to the same degree of fastness. Overall dyeing costs are not easy to estimate but the advantage is remarkable if we simply compare the approximate cost of colouring matter alone with the total surcharge for "Duracol" shades, in comparable fastness. The use of "Tricel-Duracol" in blends with wool is recommended provided the existing range of shades is acceptable, in preference to stock or slubbing dyed "Tricel," as the danger of affecting the processing and pleating properties in dyeing is obviated.

Dyeing and Finishing

The dyeing of wool in a "Tricel"/wool blend is a simple matter; a wide range of acid and neutral-dyeing acid dyes is available. The disperse dyes normally used to dye "Tricel" fibres, stain the wool appreciably, even when dyeing is carried out at the boil. Suitable dyeing assistants can be used with slow dyeing dyes to promote the uptake of the disperse dye by the "Tricel" with a relatively slight staining of the wool. Dark shades on "Tricel" can be obtained, but wool-reserved styles generally require a chemical clearing treatment for the wool.

Published information is available on scouring and milling of man-made fibre and wool blends and these man-made fibres can be divided into two classes:—

(1) Those which inhibit shrinkage. "Celafibre," "Courtelle" and "Tricel," are included in this category as they tend to reduce milling shrinkage of a blended fabric containing wool, when in percentages ranging from 20 - 60.

(2) Those fibres which promote shrinkage, e.g. "Fibro" and other regenerated cellulose fibres, which when blended with wool, produce a degree of milling shrinkage which is determined by the quality of wool with which they are blended, yarn and cloth construction being other relevant factors.

Blended cloths containing wool and "Tricel" shrink less in scouring and milling than 100% wool under all conditions of milling. "Tricel" reduces shrinkage of both fine 64's and coarse 46's quality wools. In light milling, the maximum reduction is obtained in blends, with 40 - 60% or more of "Tricel." It must be noted that "Tricel" is very resistant to alkalis in the strengths normally used for scouring, milling and dyeing. High temperature and alkaline baths can be used with safety, and these will be determined by conditions necessary not to damage the wool content of the blend. Scouring should be carried out preferably on a winch machine because dolly scouring is liable to give rope creases unless roller pressure can be reduced to a minimum.

Apart from this, "Tricel" is unaffected by normal wool scouring conditions, and treatment with soap and sodium carbonate solutions at temperatures of 50 - 60°C. is suitable for fabrics produced from blends of "Tricel" and wool. The end use for which "Tricel" or "Tricel" blended fabrics are required is dependent on construction and finishing technique. The manufacturer should therefore decide on the end use before designing the cloth, and should tell the dyer and finisher to use a routine which will impart the desirable qualities associated with "Tricel."

Heat Treatment

A property of "Tricel" fibre is that by suitable heat-treatment the regularity or orderliness of its internal structure can be modified. Heat treatment often referred to as setting, also alters some other physical properties of the fibre with important technical consequences:—

Improved Launderability, i.e.—
(1) Higher resistance to wet creasing.
(2) Improved dimensional stability.
(3) Decreased water inhibition.
(4) Higher softening temperature.

Improved Dye Fastness. When setting is carried out after dyeing it results in:—

(1) Improved fastness to washing.
(2) Improved fastness to rubbing.
(3) Improved resistance to gas-fume fading.

Permanent Shape Effects. When setting is carried out while the "Tricel" fibre is deformed, the fibre retains the deformation under a wide range of conditions, e.g. permanent pleats and embossed effects stable to washing.

In most cases it is desirable to heat treat fabrics containing "Tricel." In the case of "Tricel"/wool blends, however, no setting treatment other than decatising is recommended. When intended for pleating, decatising should be omitted or carried out at modified conditions and the fabrics should be pleated in 10 lbs. per sq. inch with saturated steam for 20 minutes. This imparts the desirable properties associated with setting.

Pleating

"Tricel" fabrics and "Tricel" blend fabrics are notable for their capacity to take and retain pleats and embossed effects. These are fixed by heat treatments which are modifications of the setting treatment already mentioned. Thus, in pleating or embossing, the fibres are deformed and set in the required position permanently. It is not generally recommended that "Tricel" fabrics or "Tricel" blend fabrics should be pre-set. With a limited number of 100% "Tricel" fabrics, it is possible to pleat after setting but extreme care and good pleating conditions are required to ensure adequate results. In woven spun blend fabrics the pleatability and performance of the pleats are dependent on a sufficient proportion of "Tricel" being present:—

"Tricel"/"Fibro" .. } 67% "Tricel"
"Tricel"/cotton .. }
"Tricel"/wool .. 60% "Tricel"

In all cases the cloth constructions should be taken into account, a firmer structure generally giving a greater durability of pleating. Two methods of processing are used to produce pleats:—

(1) Machine pleating, i.e. dry heat at high temperature.
(2) Sun-ray pleating, i.e. steam at lower temperature.

Machine Pleating. This is a continuous method of inserting parallel pleats across the width of the machine. Many light "Tricel" fabrics may be satisfactorily pleated by this method at a temperature of 165 - 175°C., whilst heavier fabrics should be pleated at slightly higher temperature and should receive a form of post-setting treatment, thus ensuring the permanence of the pleats and the development of a desirable handle. If it is desired to pleat "Tricel" and wool-blended fabrics by this method conditions should not exceed 175°C. for 10 secs. However, the process should be avoided if possible owing to the probability of a loss in strength and marked discoloration.

Sun-Ray (*Steam Pleating*). This is a more commonly used method for producing pleats. It is employed for the largest class of pleated garments, namely, skirts with sun-ray pleating. In this process, the skirt lengths are placed between radially pleated formers made of stiff manila paper. These are then folded concertina-wise, bound with suitable binding and steamed. The conditions of steaming will vary with the construction and weight of the fabric, but for 100% "Tricel" fabrics, 30 mins. at 15 - 20 lbs./sq. in. will be adequate for any weight likely to be encountered. In many cases, excellent results can be achieved by steaming for 10 mins. at 10 - 15 lbs./sq. in. pressure, but care must be taken that the goods in the steamer reach the required conditions. Fabrics containing "Tricel" in blend with wool should be processed at rather lower temperatures for slightly longer times. In general steaming for 20 mins. at 10 lbs./sq. in. pressure gives the desired result. It must be pointed out, however, that pleating carried out in an atmospheric steam box will not impart a degree of durability normally associated with permanently pleated "Tricel" garments.

Under certain conditions a fault known as "cockling" may occur during pleating; "cockling" is the formation of slight waves down the pleat. In some cases this is attributed to inadequate shrinkage of the fabric in the warp-wise direction prior to pleating, that is during the dyeing and finishing process. It is advisable, therefore, to finish "Tricel" blend fabrics so that shrinkage on steaming is about 1½%.

Some Aspects of Warp Tension Control

THE most fruitful approach to problems of tension control had been found to be detailed examination of the behaviour of let-off motions, said Mr. R. Foster (Wool Industries Research Association) in a recent lecture to Morley and District Textile Society. New ideas had emerged which showed that positive motions were capable of much better control than was generally realised if they were used correctly, whilst modifications to the design could, in many instances, eliminate some of the troubles associated with present motions. The operation of these mechanisms, he continued, followed simple mechanical principles which, if fully understood, should clear up much of the confusion which surrounded problems of warp tension control. Mr. Foster dealt with the forms of warp tension variation over which control was necessary under three classes.

Long Term Variations

These were the variations associated with the gradual reduction in beam diameter during weaving, the most obvious example being the tension increase resulting with negative motions if the braking force was not decreased at intervals. Manual adjustment of the braking force was an unsatisfactory practice because of the gradual tension changes which occurred between, and sudden changes at, these adjustments. The changes in fabric structure produced by these might not be evident in the loom but were no doubt the cause of many piece weight and length variations due to subsequent differences in relaxation. Negative motions on which the braking force was adjusted automatically should result in much more uniformity of product.

Positive motions were designed to avoid this manual adjustment, but most of these did, in fact, produce a slight tension change as the beam diameter decreased. This was due to the changing angle of the warp sheet over the back rail, therefore, it could be eliminated by some modification which would ensure that this angle remained constant. An example of this was a fixed rail situated between the beam and the back rail, in such a position as to keep the line of the back warp sheet constant. Two looms weaving the same cloth should have similar warp tensions, continued Mr. Foster. This, he said, was difficult to achieve with negative motions, but positive motions would give these similar conditions if the settings on both mechanisms were identical.

Short Term Variations

These were the variations which occurred over short lengths of cloth and produced such faults as variations in pick spacing in the form of bars. These arose with negative motions because of the difficulties of maintaining a constant braking force. Positive motions should not produce these variations if they were designed and maintained correctly. The oscillating parts of the mechanism should move freely when the system was under load, a negligible amount of oscillation being an indication of the presence of undesirable friction. Better design could help in avoiding friction, but by so doing a further difficulty might arise. Substantial increases in oscillation caused by such improvements were undesirable and preliminary tests had shown the advantages of introducing controlled damping in the form of a shock absorber. Short term variations were accompanied by stretching and relaxing of the cloth between the fell and take-up roller and this altered the rate of take-up at the fell. For this reason pick spacing variations tended to be larger with short term than with long term tension variations.

Cyclic Variations

The tension variations occurring between one pick and the next due to the formation of the shed, beating-up, and beam or back rail oscillation could be minimised by using as small a shed as possible, avoiding "bumping" conditions, and preventing large let-off motion oscillations, said Mr. Foster. The latter did not occur with some negative motions, but the only satisfactory way of achieving this condition, where necessary, with positive motions was to introduce a shock absorber.

Let-off Adjustments and Warp Tension Measurement

Only by studying the results of recent work done on warp tension control could an overlooker hope to tackle successfully the many problems which arose. Positive let-off motions were simple in operation and equally simple to adjust if the basic ideas behind their behaviour were understood. For instance, contrary to common belief, it was impossible to change the speed of letting-off by normal adjustments since these motions would only let-off at a rate determined by this warp take-up rate at the fell. Adjustments could only move the oscillating parts of these motions to different positions and should, therefore, only be used to keep these parts within the correct working limits.

The warp tensometers now available should be of further assistance in the maintenance of adequate tension control. One form was normally used with the loom standing. Because the value of tension indicated depended on the length of the warp sheet and the load/extension characteristics of the warp yarn, this instrument could only be used to compare similar looms weaving with similar warp yarns, or tensions at different parts of the same warp. A second type, designed by the British Rayon Research Association might be used on the running loom. A special lease rod containing a rubber tube was connected to a manometer. The warp tension determined the air pressure in the system so that any change in tension resulted in a change in the height of the liquid column supported by this air pressure.

Use of Trichloroethylene in Continuous Scouring and Bleaching

FOR over thirty years various methods of solvent extraction had been tried in the textile industry, so far with only a limited degree of success and that mainly with one particular fibre, wool, said Mr. W. A. S. White (I.C.I. Ltd., General Chemicals Division), in a recent address to the Manchester Section of the Textile Institute.

In 1953 I.C.I. re-examined the use of trichloroethylene for solvent extraction of textiles. Trichloroethylene was a very powerful solvent of oils and waxes and appeared to be able to extract both the natural fats in the raw fibres and the oils, deliberately or accidentally added during the manufacture of textiles. Trichloroethylene had a number of valuable properties such as non-inflammability, absence of chronic toxicity (although it had anaesthetic properties) good stability and high vapour density. Its low boiling point, low specific heat and low latent heat of vapourization ensured moderate demands on fuel and cooling water. I.C.I. engineers designed and constructed a small pilot plant for the continuous scouring and bleaching of textiles, the first operation being the removal of fatty matter by means of trichloroethylene. Work conducted on cotton was subsequently extended to various natural and synthetic textiles.

Cotton

For removing wax from cotton, trichloroethylene was for all practical purposes as efficient as chloroform or methylene-chloride the solvents normally used in estimating cotton wax. Immersion in boiling trichloroethylene for only about

15 to 30 secs. reduced the wax content of cotton cloths to approx. 0·15% from grey fat and wax contents of the order of 0·7% to 1·2%. The weight and construction of the cloth made very little difference to the rate or extent of extraction. The natural moisture of the cotton had little effect but extraction was impaired if the cloth was saturated with water before the solvent treatment.

Published literature upon the exact function of wax in relationship to absorbency presented a number of anomalies, but there was no doubt that if the bulk of the wax was removed by solvent extraction it was then a relatively simple matter to make the cloth absorbent. Absorbency could be achieved by giving mild oxidation treatments that would effect little or no improvement in the absorbency of undewaxed cotton. De-waxed cloth was also rendered absorbent by the hot water treatment used primarily to extract solvent held in the cloth.

The hot water method consisted of passing the cloth through water at a temperature above 73° the steam distillation of trichloroethylene. This "hot water flash-off" provided an effective means of recovering the solvent and in addition wets the cloth thoroughly, removed part of the work size, and also dispersed any residual surface wax with the result that the cloth became uniformly absorbent—a very important point.

It was thought that by following the dewaxing with a peroxide bath to effect desizing and part bleaching a basic method for the rapid scouring of cotton cloth could be formed. The peroxide bath consisted of first saturating the cloth in cold peroxide solution of 1 - 2 volumes and containing 7 - 15 grms./litre of sodium hydroxide and then steaming longer as the peroxide was unstable.

With regard to the commercial success of the continuous process of dewaxing and desizing, in the dewaxing stage the loss of solvent was important, however this loss was very small being approximately 2% on the dry weight of material treated, equivalent to 1s. 3d. per 100 lbs., of cloth. The amount of trichloroethylene retained in the cotton was negligible. As there was a small progressive loss of the organic stabilisers present in commercial trichloroethylene they had to be added periodically, this however, presented no material increase in running costs. The desizing stage had given no difficulties and bleaching results were generally satisfactory. The only important objections encountered were that in some materials the degree of whiteness and mote removal were inadequate for dyeing to very pale shades.

The use of a short intermediate stage prior to desizing was one of several methods in an attempt to solve this problem and the most successful of these stages appeared to be the use of a cold acidified hypochlorite bath which activated the desize stage to produce whiter cloth. For stubborn cases where the motes persisted, a continuous 30 mins. bath in peroxide or chlorite, after dewaxing and desizing, was advised. For a fully continuous process to give completely desized and fully bleached cloth by the peroxide method, it was estimated that the cost of chemicals would be about 4s. 0d. per 100 lbs., of cloth.

Rayon

Rayon and various mixture goods with the exception of viscose/acetate responded excellently to this treatment.

Wool

As trichloroethylene would remove mineral oils from wools just as effectively as it did oleine, a cheaper spinning oil containing a high proportion of mineral oil could be used without a subsequent increase in the cost of scouring. Removal of the finely divided dirt which was sometimes redeposited had, on the whole, been satisfactory. A very clean finished piece was obtained by following the process with soap milling.

The "hot water flash-off" of the process obtained a good deal of shrinkage and consolidation. Less loss of fibre, less water consumption, less effluent and no possibility of alkali damage were other advantages over normal methods; also, in general, dyed goods did not bleed. A large still was required to cope with oil and the large accumulation of flock must be removed.

Worsteds could be successfully treated in open width form.

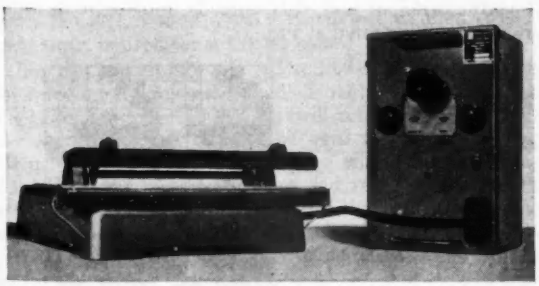
Jute

Jute could also be successfully treated but there appeared to be no financial advantage in doing so unless a wet process was to follow. The trichloroethylene process had proved commercially successful in removing the size used in weaving and spinning glass fibre. In conclusion it was thought that the continuous solvent extraction of textiles could now be accomplished in a safe and economical manner and that the process has a number of important applications.

New Automatic Heat Sealer

EXPANDING uses for present day plastics for packaging purposes seems to grow with almost every week and the advent too of new types of "film" result in interesting developments. Manifold Machinery Co. Ltd., 660 Great Cambridge Road, Enfield, have for some time past been carrying out experiments for the development of an impulse heat sealer that would be capable of sealing a wide variety of types of film (without the necessity of modifications to a standard machine) and to offer it at less than £100. This they have achieved and their new automatic impulse heat sealer will handle polythene, melinex, nylon, P.V.C. and coated papers to other materials.

The standard model, shown in the illustration, has 16 ins. jaws that are covered with a special tape which ensures that no sticking or burning at the edges of the material being sealed, takes place. It is capable of sealing material up to ·050 in. thickness (e.g. two thicknesses of ·025 in.), can be operated in any position, and gives outputs up to 1,200 seals per hour according to the type of material being handled.



This new automatic impulse heat sealer seals polythene, nylon, P.V.C. or coated papers to other materials

The automatic control unit on the right of the illustration, has three dials mounted on the panel. The centre dial controls temperature of weld, the right-hand dial controls heating time of weld and that on the left controls cooling time of weld.

Standard electrical specification caters for 220/250 volts, 50 cycles, single phase and no special fitments are required apart from the normal 5 amp. 3-pin socket mains supply. Operation is simple, just switch on, insert the material and press the foot switch—the complete cycle will then automatically take place irrespective of the amount of time that the foot switch is held down. Adjustment of the control unit is easy and a few trial seals will quickly find the best setting for the thickness and type of material to be sealed. No further adjustment should then be required. This impulse heat sealer can be used for the packaging of powders, granulated materials, liquids or solids.

A reel carrier attachment is available as an extra and can be added or taken off as required. It will be found most useful for the small quantity making of bags from layflat or gusseted tubing or where small sampling runs are needed.

Wool: Twill, Satin and Fancy Weaves

Counts, ends and picks, and brief descriptions of a range of four-end twills including flannels, serges, coatings, checks, tweeds, meltons, etc.

By W. MIDDLEBROOK

A 2×1 TWILL fabric, named after the Australian town from whence comes the wool that makes it, is called *paramatta*. Originally a dress fabric of silk and worsted, it is also made wholly of worsted yarns, and may also be known as a *coburg* because it was introduced shortly after Queen Victoria's marriage to Prince Albert of Saxe-Coburg. The 2×1 twill weave is classed as a *cashmere twill*, this fabric being originally a soft woollen material from the hair of a Tibetan or Kashmir goat. *Cassock cloth*, used for black, clerical garments, is a worsted *cashmere*, and a superior quality dress fabric is called a *royal cashmere*.

Amazon is a dress fabric that may have a worsted warp and wool weft, a 2×1 warp twill; the warp-face is sometimes improved by using a five-end satin weave for this cloth. Mohair is used for a fine dress fabric called *angora cashmere*, with a light, soft finish. *Edredon*, which is the French term for eiderdown, is a fine woollen dress fabric with a 2×1 weave, also used in the heavy West of England overcoating material called *blanket cloth*. *Paddock coating*, a proofed fabric in fawn and brown shades, is a light-weight 2×1 twill. *Empress cloth* is a double cloth, a woollen dress fabric with a 2×1 twill face and a fine ribbed back. With *Charmelaine cloth*, a botany wool dress fabric, a 1×2 twill is used, and another 1×2 fabric that may be all botany is called *Henrietta*, a dress cloth 64×144, 59s/72s.

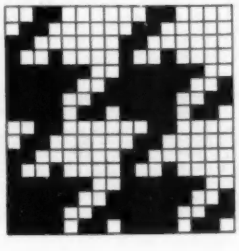
Four-End Twills

As with other yarns, the four-end 2×2 twill is a popular medium for woollen and worsted material, with such worsted fabrics as *tennis flannel*, *french cashmere*, *estamenes*, *art serge*, *anacostas* and *imperial coating*. *French cashmere* is an all-worsted dress fabric with a 2×2 instead of the more usual 2×1 cashmere twill, one quality being 60×120, 42s/48s, with a botany warp. The French *estame* means "worsted fingering," and *estamenes* is a 2×2 worsted with a loose weave of rough yarns made to imitate the knitted worsted *estame* of France; one quality is 56×56, 2/36s warp and weft. *Art serge* is a piece-dyed fabric of fine worsted yarns, used for draperies and table covers, while *anacostas* is another worsted 2×2 twill, a dress fabric. *Imperial coating* is a 2×2 worsted of botany yarns, one quality being 84×84, 2/60s warp and 40s weft. The normal angle of a regular twill such as the 2×2 is 45°, but this angle becomes much steeper when the cloth contains many more warp than weft threads; a good example of this is a worsted *gaberdine*, a tightly-woven fabric in which the close-knitted weave is essential as an aid to the waterproof qualities of the finished cloth. A gaberdine in which the twill angle is about 60° has 110 warp threads and 70 weft picks per inch.

In the middle ages the *gaberdine* was a coarse, loose gown worn by Jews and pilgrims, the name being derived from old French *galverdine* and the German *walfahrt*, meaning "pilgrimage". The true *gaberdine* of the present day is a high-quality fabric with a fine, smooth finish, used chiefly for raincoats, light summer coats, costumes and suitings. There are many different qualities, the best an all-worsted fabric of high-grade merino wool, with cheaper qualities of worsted warp and cotton weft, or of one worsted and one cotton thread twisted together; the cheapest, already mentioned in the section on cotton fabrics is wholly of cotton. *Cordurette* is a woollen dress fabric that may be plain weave or 2×2 twill, with a warp cord effect. Other woollen dress fabrics that may be made in fancy twill weaves include *andalusians*, of Spanish merino wool; *bivouac*, made with nub yarn and small twill effects that keep the nubs on the face of the fabric; *calmuc*, a loose-woven twill with a long nap for winter dress goods; and *prunella*, a light-weight dress goods fabric the design of which is shown at Fig. 36.

A light woollen cloth with a 2×2 weave, used for coat linings and for liveries, is called *shalloon*, from the French town of Chalons; this French town also gives the name of *chalon* to a black wool dress or suiting material, also a twill weave. Another light-weight woollen fabric with a 2×2 ground is a Scottish tweed overcoating known as *hungback*; the name springs from the fact that extra ends of stripe or check in a 3×1 twill weave are "hung" at the back of the fabric. Many costume and coating cloths use the 2×2 twill weave to produce what is known as a *dogstooth* or *shepherd's check*. This may be woven in two or more colours, with sometimes an over-check added to give interest to the design, and the effect is obtained by arranging warp and weft in the order of four dark threads, four light threads alternately, as illustrated at Fig. 37.

(above) Fig. 36



(right) Fig. 37

There is a wide range of heavy quality fabrics of wool in the 2×2 twill weave. *Carriage robes*, for example, is an American term for heavy wool blankets and carriage rugs with a 2×2 twill weave; heavier cloths, with a double weave—double cloths with twill weaves that are stitched together in the loom by a cotton warp—are used by the Americans for motor-car coats, blankets and wraps, known as *automobile cloaking*. Another American term is *buffalo cloth* for a heavy, twilled overcoating with a long nap.

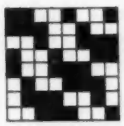
Tweeds are chiefly woven as a 2×2 twill, in checks and stripes; a wide range of wools is used in the making of tweeds, and the term "tweed" refers more to the colour and design than the material and weight. The usual impression of a tweed is of a rough, hard-wearing cloth especially used for sports wear and informal occasions, though they are also used for men's and women's suits and overcoatings. *Saxony tweeds*, made largely in the West of England, contain Saxony and Hungarian wools of fine quality, fabrics with a clear or dress face finish that are smooth and soft to handle. Other tweeds, made in the border mills of Scotland, contain coarser wools such as Cheviot, while the well-known *Harris tweed* is a firm, heavy and rough hand-woven material of virgin mountain wools made in the islands of the Outer Hebrides. *Donegal tweed* is another hand-woven fabric, from Ireland, made with coarse wools and often distinguishable by a characteristic speckled pattern; a feature of Harris and Donegal tweeds is the heavy sprinkling of thick, chalky-looking fibres known as "kemps." *Cannockburn tweed* is a Scotch Cheviot fabric with alternate threads of marl twist in warp and weft; *Bannockburn* is a rough wool suiting and sports clothes fabric. *Bliss tweed* is a whipcord fabric of wool used for liveries; the word *tweed* does not, of course, refer to the Scottish river of that name.

Serge is well-known today as a strong twilled cloth of wool or worsted, usually dyed blue or black, but at one time the name referred to a coarse, twilled silken fabric, and is believed to have sprung from the Latin *sērica*, meaning "Chinese or silken (*lāna*) wool," from *sērēs* the Chinese. *Serge* is a French name, one that has been mentioned before in connection with the cotton fabric *denim*, a contraction of *serge de nîmes*. This, in effect, gives us three distinct yet similar fabrics with the name of *serge*, a coarse twilled silk, a coarse twilled cotton and a strong, hard-wearing twilled woollen. The woollen serge is usually a 2×2 twill, but may be 3×3 or even 4×4 in the coarser grades; it is used for caps, coats, costumes, robes and wraps, suits and uniforms.

Navy serge is a strong fine serge of worsted, dyed indigo for naval uniforms; *Navy twill* is a heavy-weight twill *flannel* used for working shirts. *Foule serge* is a woollen dress fabric; *Foulie* is a serge twill dress fabric of single worsted yarns, the twill weave being invisible after the finishing process—the French *foulerie* applies to the *fulling* mill. The term appears again in *Foule cashmere*, a coarse woollen cashmere dress fabric. Another coarse dress material of serge is called *cangette*, first made in the French town of Caen. *Storm serge*, a closely-set woollen twill for hard wear, is used for women's coats.

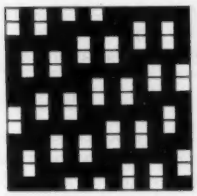
Box cloth resembles felt, a 2×2 twill weave being used for a woollen fabric, heavily milled, with a dress-face finish. *Pilot cloth* is another four-shaft twill, a heavy woollen indigo overcoating with a thick nap, used for seamen's coats. *Cassimere* is a close-woven woollen with a smooth face, a 2×2 twill with a worsted warp and wool weft. *Molletons* are 2×2 twills that are heavily napped at both sides, for use as dressing gowns.

The name *melton* was first applied to the hunting jacket worn at Melton Mowbray, but is now chiefly associated



(above) Fig. 38

(right) Fig. 39



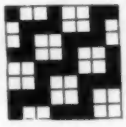
with heavily milled overcoating and blazer cloths. Woven in wool, with a 2×2 twill weave, the cloth in the loom state often presents an open and sack-like appearance, but the milling process causes the fabric to felt and shrink, giving it a compact, smooth handle and appearance. Such heavily-milled fabrics as *meltons*, *billiard cloths* and *doeskins* may shrink as much as 35% during finishing; *Flannels* receive a lighter treatment and rarely shrink more than 20%.

Kersey is a woollen fabric first made at Kersey, in Suffolk, and this gives the name to *kerseymere*, a close-woven serge twill coating fabric with a close nap. Cheaper varieties of coarse woollen with a bold rib and a 2×2 twill weave are known as *kerseys*. A fine worsted fabric made in twilled designs of dark colours, with hard-twisted yarns, is named after the town of *Amiens*. *Drummond* is a worsted twill made in an Oxford grey shade. *Clays*, named after the manufacturer, is a 3×3 worsted twill cloth, 67×64, 2/30s warp and 14s weft. A smooth twill of hard-spun English worsted yarns, introduced by Dutch settlers in the reign of Henry I is called *bombazet*; this is another version of *bombazine*, the French name of a twilled worsted dress material that was sometimes mixed with silk or cotton, the word being derived from the Latin *bombācinum*, and the Greek *bombyx* or silkworm.

Mayo dress fabrics may be of silk, worsted or super double cotton warp and botany weft, with an eight-end Mayo twill weave as shown at Fig. 38. *Satin moss* is another worsted dress fabric with a fancy twill weave and worsted crepe yarns, one quality being 60×52, 30s/40s. *Belwarp* is a fine worsted dress fabric with a corkscrew twill, one example of which is shown at Fig. 39; *Beige* also is a worsted dress fabric, 76×72, 36s/36s, the yarn being dyed before spinning. When the 2×2 *hopsack* weave is arranged in twill order, it is termed a *barathea*, fine worsted yarns being used to make a high quality fabric used for men's dinner suits and officers' uniforms; an example of this weave is shown at Fig. 40.

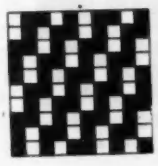
Peau de mouton, or "sheepskin," is made of worsted with a twill weave and a curled pile to imitate the real thing, being used for ladies' cloaks. Another worsted fabric with an odd name is *janus cloth*, a dress or coating fabric of dyed yarns and two colours or weft; it is a double-faced cloth, each face being a different colour, and this is why the fabric is named after the two-faced god Janus, who was the Roman god of doors and gates. He was represented with two faces, looking behind and before, and his temple was closed in peace and kept open in times of war.

Cadet cloth is a five-shaft woollen twill used for coatings and uniforms at military schools; the design, which gives a



(left) Fig. 40

(right) Fig. 41



three up two down warp face weave, is known as a *doeskin twill*, and is shown at Fig. 41. Heavy woollen coating fabrics on an eight-shaft twill weave are called *sardinians*.

Satins and Fancy Weaves

The essence of a satin weave is its smooth feel and appearance, with an absence of lines or ribs, and a preponderance of warp or weft on the surface according to the weave; it may be either a warp-face satin or weft-faced. When silk, rayon, mercerised cotton or similar yarns are used, the natural sheen of the yarn is exploited to its full advantage; with a fibrous yarn like wool the sheen is nothing like so prominent, but smooth worsted yarns are mostly used, making fine fabrics that are used for dress wear and coatings. *Amazon*, the design of which is shown at Fig. 42, is a dress fabric that is often made with a worsted warp and woollen weft, the five-end warp-face weave throwing the bulk of the fine worsted yarns to the surface. Another worsted dress fabric is known as *French backed*, having a weft-satin back to the cloth; a similar fabric is the *French backed twill*, having a twill face and weft-satin back. *Janus cloth*, already described under "twills," may also be made with a satin weave at each side of the fabric, in different colours, and is used as a dress or a coating fabric of worsted. *Jaspelline* is a woollen coating material with a double satin weave, using 2/60s botany warp.

Satin berber is a strong worsted fabric with a satin weave and a lustre finish; another strong satin, as its name implies, is *satin vigoureux*, a heavy worsted dress fabric with satin stripes. The name means "stout satin." *Buckskin* is a fine woollen fabric, a warp-face eight-end satin with a raised and milled finish; one quality is 60×60, 19s/14s, and a buckskin satin weave is shown at Fig. 43. *Doeskin* is a similar type of fabric, of best botany wool, with a five-end satin weave.

Denmark satin is of thick worsted yarns, dyed and glazed for the making of slippers; another footwear fabric is called *everlasting cloth*, a warp-face satin with a fine, close weave, of wool or wool and cotton. One quality is 160×76, and the fabric is used for gaiters and shoe tops. *Eskimo cloth* is an all-wool overcoating, a double-faced fabric with a five-end satin face and twill back. *Italian cloth* is often made with cotton and wool, a weft-faced satin, heavily picked, with a smooth surface that is given a fine and lasting gloss in the finishing process; one quality of a true *Italian* is 90×120, 2/80s botany warp and 60s weft, and a typical *Italian cloth* design is shown at Fig. 44. *Blazer cloth* has already been described with a twill weave, but this fabric can also be made as a five-end satin, one quality being 116×68, 2/50s warp and weft.

A fancy twill weave is used in a worsted dress fabric known by several names, including *satin moss*, *vienna*, *albatross*, *snowflake* and *llama croisé*. One example is 60×50, 30s/40s worsted crepe yarns, a crepe effect being given from the high twist yarns. *Andalusians*, as the name implies, are made with Spanish merino wool, dress fabrics with a fancy twill weave. *Crocodile cloth* is a high quality dress fabric made on a jacquard, using woollen yarns with a Bedford

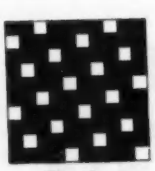


Fig. 42

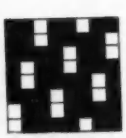


Fig. 43

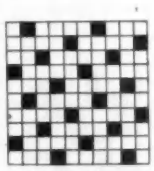


Fig. 44

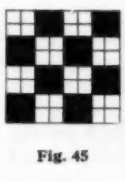


Fig. 45

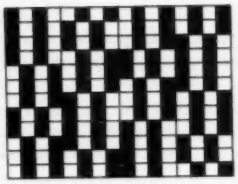


Fig. 46

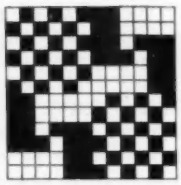


Fig. 47

cord stripe effect; small dobby weaves are used in the making of *Lahore cloth*, a dress fabric of fine cashmere, one quality being 84×66, 54s/48s worsted yarns. Another dress fabric is known as *hopsack*, with a matting weave of two or three ends together; the 2×2 hopsack or Celtic weave is shown at Fig. 45, and one example of this cloth is 56×56, 2/26s.

The small pebbled weave of *armure*, shown at Fig. 46, gives point to the name, which is French for *armour* or chain mail. There are various types and qualities of this fabric in the wool trade, one being a wide cloth for dresses and coats, with an end-and-end warp of mohair and worsted, 72 picks/in., and 68 picks/in. of 32s worsted singles. A heavy woollen *armure* is made with brocade figures on an armure ground, for use as draperies and curtains. *Armure royale* is a worsted costume fabric on an 11-shaft armure weave, and *Armure Victoria* is a dress material with a finish that gives a dull black ground with small brocade figures. A worsted damask is called *beige damas*, which means natural or undyed damask, a dress fabric with brocade designs on a twill ground. Another worsted is *mascaret*, a loosely woven satin ornamented with dobby figures, and *satin back coating* is a worsted with a fancy twill face. A strong fabric of worsted yarns in fancy designs, popular in the early 19th century for use in churches, was called *amens*. The Brighton weave shown at Fig. 47 is used in the making of woollen vestings ornamented with spots of silk or rayon, known as *brightons*. A small matt or basket weave is used for the woollen fabric *camelina*, and *pompadour serge* is a wool cloth ornamented by small floral patterns.

Tartan Specialities

No black and white reproduction can ever do full justice to the beautiful and subtle colourings in tartan patterns. How few colours are actually used in the constructions of tartans is not always realised, and these lovely cloths need to be seen and handled to appreciate the romance and character associated with them. Reproduced approximately ⅛ths size, linear, the patterns on the facing page are from the ranges manufactured by Peter Macarthur and Co. Ltd., tartan specialists, 207 Ingram Street, Glasgow, C.1. Brief details are as follows:—

(1) Class 28. An all worsted clergy muted miniature. The quiet tones are grey, brown and a pastel blue; 56 ins. wide, it is 6½ ozs./yd.

(2) Class 28. All worsted, ancient Stewart muted miniature. A beautiful effect achieved by fine colour balance and weave. Grey, crimson, light-blue and greenish/brown yarns are employed in both warp and weft; 56 ins. wide and 6½ ozs./yd.

(3) Class 28. All worsted MacNaughton muted miniature. Weave and skilful colour selection produce a gentle shaded effect in the colour changes in both warp and weft; 56 ins. wide and 6½ ozs./yd.

(4) Class 20. MacKellar muted in 100% pure, new wool. Dark-grey, light-blue, canary, blue-grey, brown and white yarns give a clear-cut pattern and a diagonal weave effect; 54 ins. wide and 8½ ozs./yd.

(5) Class 20. A 100% pure, new wool green Douglas muted. The pronounced diagonal weave and balanced squared effect is achieved with white, light-blue, blue-grey, grey and brown yarns; 54 ins. wide and 8½ ozs./yd.

(6) Class 20. Colour contrast at its best. A red Hamilton in 100% pure, new wool. Another diagonal weave and bright blue, crimson and white yarns in both warp and weft; 54 ins. wide and 8½ ozs./yd.

Textile Institute Conference

The theme of the Institute's recent annual conference at Scarborough was "Machinery for Textiles: the Demands of the Industry." Abstracts from two of the papers have already appeared ("T.M.," June p. 264-8) and further abstracts are given on this and succeeding pages

The Mangle as a Machine

By E. MOSS, B.SC., A.R.I.C.†

THE main uses of mangles are in washing—open width and rope—for water removal, and for padding and impregnation. Increasing use is being made of padding processes in dyeing, e.g., pigment padding and resin application of dyes. For dye padding and resin application, a high standard of mangle performance is required particularly in nip uniformity. A good performance is equally desirable in water removal. Efficiency of squeeze between immersions is of great importance in washing. Factors which should be taken into account in the design of mangles include temperature, speed, load, bowl diameters and cover characteristics. Their effects on water retention are broadly similar for cloths of different types of fibre and structures. In considering these factors, it is assumed the cloth is thoroughly wetted out before mangling.

Temperature at the nip has a marked effect on water retention; retention falls rapidly as the temperature of the cloth entering the nip is raised. This effect is due partly to the decrease in water viscosity with increasing temperature, which makes it easier for water to flow back from the nip against the direction of motion of the cloth. Changes in fibre swelling with temperature also affect the water retention by altering the amount of water absorbed by the fibres. It is unlikely that the pressures occurring in mangling will remove an appreciable amount of this water. The magnitude of the temperature effect is indicated by the results of measurements on five cotton cloths in a nip between a 14 ins. stainless steel bowl and a 19 ins. bowl with a ½ in. "sycamore-hard" rubber cover, at 36 yds./min. and a load of 200 lbs./linear in. At 5°C., the average water retention* was 71% and at 65°C., 58%. Assuming the final regain of the dried cloths to be about 5%, increasing the temperature of mangling from 5° to 65°C. reduced the amount of water to be removed in thermal drying by one-fifth.

The effect of cloth speed is comparatively small. Throughout the range 15 to 100 yds./min. a two-fold increase in cloth speed increases the water retention of cotton cloths by about 3%, of viscose cloths by about 3½%, and of nylon cloths by about 1%; these figures are roughly one-twentyfifth of the retentions. A substantial reduction in speed would thus be required to obtain a significant decrease in the water retained after mangling.

Water retention after mangling decreases with increasing load on the nip, but at a diminishing rate. For instance, when an increase in load from 50 to 100 lbs. per linear in. reduced the retention by 3%, an equal increase from 350 to 400 lbs. per linear in. produced a reduction of only 0·4%. A reduction in bowl diameter leads to a reduction in water retention, but again the effect is small.

The material bowls are made of, their hardness and, in the case of rubber covers, the thickness of the cover also, all affect water retention considerably. The effects of all these factors and also of load and diameter are included in one relation, that between mean pressure and water retention. The pressure in the nip is, of course, not uniform, but increases to a peak and falls again in the direction in which the cloth and bowls are moving. Mean pressure is simply the average of this distributed pressure and is given by the load per linear inch divided by the nip width. Mean pressure-retention curves show a rapid fall in retention with increasing pressure at low pressures, but a much lower rate of fall at high pressures. The relation is an empirical one and only approximate; it is not suggested that the mean pressure is the real operative factor in determining the water retention. It is, however, very useful in comparing the effects of different types of nips, and is obtained from easily measured quantities.

An increase in applied load increases the mean pressure, but, since it also increases the nip width, the change in pressure is never as great as the change in load. At high loads, the nip widths show a smaller fractional change and there is a correspondingly larger change in mean pressure. Bowl diameter affects nip width, smaller nip widths and hence higher mean pressures being obtained with smaller diameter bowls.

Bowl hardness also affects the nip width. A harder bowl gives a smaller nip width and a higher mean pressure. With rubber-covered bowls, the thickness of the cover can influence appreciably the effective hardness of the bowl, a thinner cover having a greater effective hardness. If two soft bowls are used instead of one soft and one hard (metal or ebonite) bowl, a wider nip and lower mean pressure will result. The effect of replacing the hard bowl in a nip by a soft bowl identical with the one already there will be to reduce the mean pressure to about two-thirds of its previous value.

† *British Cotton Industry Research Association, Shirley Institute.*

* *All water retentions are expressed as percentages on the oven-dry weight of the cloth.*

Some Newer Designs of Mangle

Two trends can be discerned in the newer designs of mangle which are being offered by the textile finishing machinery makers. One trend is towards simplicity and ease of maintenance, and is exemplified by the two-bowl inclined-nip padding mangle of F. Smith and Co. (Whitworth) Ltd. and Mather and Platt's two-bowl offset padding mangle. These mangles are pneumatically loaded and have large-diameter bowls, both rubber-covered. Deflection of the bowls at maximum load is very small and can almost certainly be neglected. The Mather and Platt machine has skewing of the top bowl, but this is hardly necessary on account of the small deflections present. It is claimed, probably with some truth, that the skewing can be used to correct for wear, but it cannot do more than postpone the time for regrinding.

The other trend is towards methods of providing uniform distribution of load by modifying the loading system, usually at the expense of mechanical complexity and increased maintenance. An ingenious system is that used in the Farmer Norton level pressure mangle. (Fig. 1).

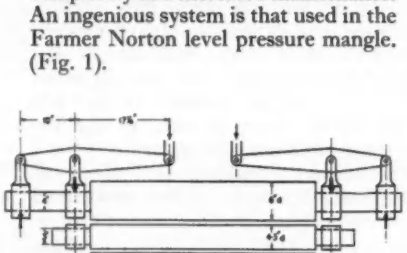


Fig. 1. Principle of Farmer Norton level pressure gauge

In the squeeze mangle version, the outer bowls are hard and the middle bowl is the "soft" bowl. It is a filled bowl of disk construction and harder than a "sycamore-hard" rubber-covered bowl. The bowls are of fairly small diameter and have no camber. The top bowl is provided with two bearings at each end, and the load is applied to each pair of bearings from a pneumatic piston through a simple lever system. By this means, a couple is applied to each end of the bowl shaft tending to deflect the bowl in the opposite direction to that due to normal bowing deflection. The bottom bowl is usually supported by single bearings at each end, and the counter deflection of the top bowl is made sufficiently large to balance both its own bowing and the bowing of the bottom bowl. The middle bowl, being a filled bowl of small diameter readily conforms to the deflection present.

l. to r. Dr. F. C. Toy, C.B.E., F.T.I. (chairman of "The Mangle as a Machine" session) is pictured here with Mr. E. Moss, B.Sc., A.R.I.C. (British Cotton Industry Research Association

One feature of the system is that the correction applies at any load. A disadvantage is that the top bowl bearings have to withstand considerably higher loads than would normal single bearings and the shafts are deflected. For example, in the machine studied, where the load applied to the nip is 6 tons, i.e., 3 tons per side, each inner bearing carries about 8 tons and each outer bearing 5 tons. For this reason, roller bearings and special steel for the bowl have to be used.

The machine gives a very efficient uniform squeeze, due partly to the high load with correction for deflection, and partly to the small diameter and the composition of the middle bowl. The top bowl with ebonite cover heats up rapidly when run under load without cloth in the nip, indicating large strains in the ebonite. The ability of the mangle to stand up to long continuous use without undue wear and maintenance can be decided only by actual use over a prolonged period.

The Kusters mangle achieves a high mean pressure by using bowls of small diameter, one of which is a hard filled bowl of Perlon, and a uniform distribution of load by applying it by means of an inflatable air bag through pairs of jockey rollers. The Perlon bowl cannot be used for dye-padding and, if it is replaced by a rubber-covered bowl, much of the advantage is lost. Again, the system requires more maintenance, particularly of the jockey rollers. A recent and even more complicated development is the Kusters-Hunt "swimming" bowl, in which load is applied to the nip by means of oil pumped into half of the annular space between a fixed central shaft and a shell which is free to rotate about the shaft, being mounted in self-aligning bearings. Oil seals are provided at the ends of the annulus, and longitudinal seals limit the oil to one-half of the space. In addition to the oil supply, load is applied to the ends of the shaft by air pressure. The pressure-applying system includes a proportional valve which keeps the air pressure in a fixed ratio to the oil pressure. By setting the proportional valve to give the appropriate factor of proportionality, the deflection of the shell can be made equal to that of the companion bowl.

A promising design of squeeze mangle, which has the merit of simplicity, is the Kusters-Hunt Aqua-roll (Fig. 2), still in course of development. The Perlon bowl of small diameter floats on water through which the pressure is applied. Trapped air

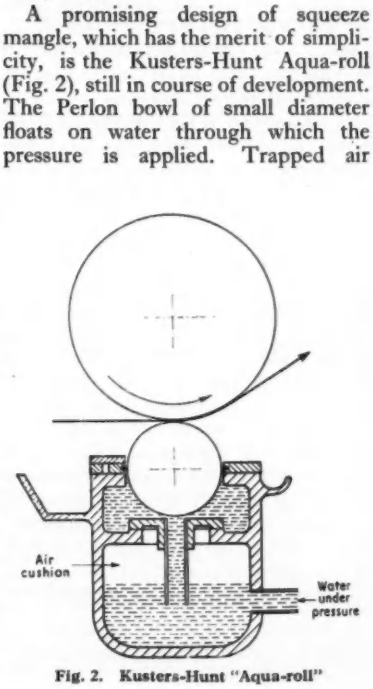


Fig. 2. Kusters-Hunt "Aqua-roll"

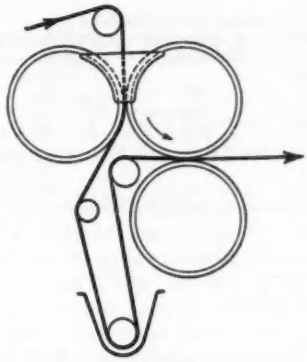


Fig. 3. Konrad Peter "Econom" padding mangle

provides the necessary cushioning. Sealing at the sides of the bowl is by brass strips backed by inflatable air-bags to allow for reduction of bowl diameter on re-grinding. Doctor blades can be used on the bowl to prevent leaking water from reaching the cloth.

The Konrad Peter Econom padding mangle (Fig. 3) is of interest because it has three bowls so arranged as to provide two nips which are loaded independently. It also has one trough of very small volume formed by two of the bowls, the second trough being of more conventional design.

Conclusions

In the current state of the industry, efficiency in all technical processes is imperative and, because of the high and increasing cost of fuel, nowhere more so than in drying. As a continuous mechanical process for the removal of water from most types of cloth, mangling has no real competitor at present. Many of the squeeze mangles in use today are inefficient, but could be brought to a higher level of efficiency by overhaul, by employing more suitable bowls and bowl covers, by appropriate correction for deflection, and by modifying the conditions of operation. More use could be made of increased temperature at the nip to reduce retention. From the point of view of drying, low retention is as important in filling as it is in water removal. So far, the newer designs of mangle do not appear to give much better water removal than well-designed conventional mangles used to the best advantage.

Padding is being used increasingly in colouring and in the application of resin finishes. It may be necessary to utilise bowl covers of limited life with frequent replacement. The rapid attack on conventional bowl covers by chemicals may require the introduction of synthetic rubbers and other polymers as covering materials.

Apart from uniformity of nip, the requirements of squeeze and padding mangles are usually very different.

In general, the success of new designs, however ingenious and promising, cannot be predicted with certainty. Extended use in the industry is required to prove their value, and a machine running continuously under works conditions cannot be expected to produce quite the results that can be obtained in tests under ideal conditions.

Optimum Cloth Width and Machine Size in Textile Manufacture

By D. BRUNNSCHWEILER, M.SC.(TECH.), F.T.I.†

MOST individual textile processes form part of a sequence, terminating in the production of the ultimate fabric or garment. Although optimum operating conditions can be separately determined for each process, these conditions may only occasionally coincide with the requirements of the sequence as a whole. Nevertheless, in so far as many sections of the textile industry are horizontally organised into relatively small groups of processes, it is frequently useful to understand the degree of inefficiency to which any given process may be subjected in the general interests of the complete operation. From an understanding of the optimum operating conditions for individual processes, it is usually not too difficult to determine the most favourable circumstances for several interdependent processes, and hence for the full sequence.

Machine Cost

If a machine consists of a standard headstock* attached to and controlling a frame of variable size, the equation for machine cost C takes the form

$$C = a + nb$$

where n is proportional to the fabric width or its equivalent and a and b are cost parameters which are constant for the particular type of equipment. While this relationship is exact in examples such as warping machines, where a given size of headstock may be fitted with a creel having any desired number of creel units, n, for many other machines the relationship holds good only for a limited width range. From an analysis of data supplied by machinery makers covering a very wide range of machine widths, it appears that, for the type of equipment discussed in this paper, the relationship between machine cost and width is approximately linear, the curve passing close to the origin. Not infrequently, the cost curves overlap at certain widths. It follows that a machinery maker who wishes to standardise on a single type of headstock, which is used with all sizes of frame, necessarily tends to penalise users of machines at the narrower end of the range.

Weaving

Automatic looms differ from the machines previously considered, in that relatively large numbers of looms can be looked after by one operative. Because of this, it is possible for an operative to be given a reasonably similar work load with different numbers of looms, according to warp width. By basing comparative costs on the production of a set of looms with a fixed operative work load, the element of operative wage cost has been eliminated. Similarly, it has been assumed that the numbers of looms allocated to overlookers, oilers and cleaners is a function of the number of looms per weaver, and that the wages

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* *The term "headstock" is usually applied to the drive and control unit at one end of a spinning or winding frame, and to the beam stand and control unit on a beam warping or sizing machine. The same headstock is employed for any number of spindles up to some maximum, or for any size of creel or length of machine in the latter instances, and thus represents a fixed item of capital cost. While other machines such as looms do not have a headstock as such, many mechanisms attached to the end frames are the same whatever the width between the frames, so that the fixed cost of such items is sometimes referred to as the "headstock cost."*

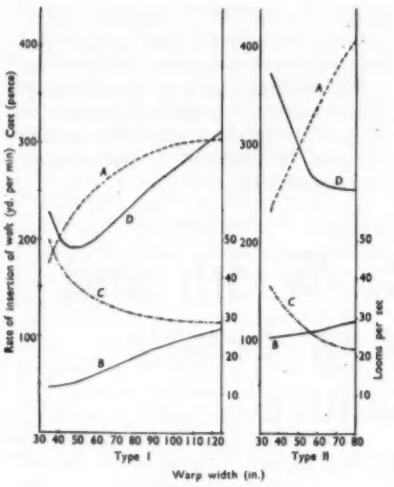


Fig. 1

LOOM WIDTH AND OPERATING COST

A — Rate of weft insertion (yd. per min.).
B — Operating cost of ten looms (interest, depreciation, maintenance, power and floor charges) in pence per hour.
C — Looms per weaver (0·24 min. stopped time per in. warp space per 100,000 picks assumed; 42 mins. work per weaver per hour on stopped looms.
D — Operating cost of one set of looms in pence per hour.
Interest, depreciation and maintenance, 15%.
Power at 1·5d. per h.p.
Floor space at 2s. per sq. ft. per annum.
3,700 working hours per annum (2 shifts)

of such personnel can be allocated on the basis of area of cloth produced. This last assumption is at variance with assumptions made elsewhere concerning the effect of loom width but is in agreement with much Lancashire practice.

In Fig. 1 a comparison is made between the operating costs of a set of single-shuttle automatic looms of various widths producing a simple plain-weave cotton cloth, the basis of production being the average hourly production (i.e., a fixed area of cloth) of one weaver. A constant stoppage rate per unit of warp width has been adopted. Type I looms are standard automatic looms where different models cover warp widths from 35 ins. to 125 ins. Type II looms are high-speed machines covering a more limited width range (35 - 80 ins.) with a single model. As well as being more expensive generally, the Type II machines are particularly expensive at the narrower end of the range. Whereas the slope of the production curve of Type I machines (graph A) falls off appreciably with increasing width, this is not so marked with Type II machines. Owing to their higher speed, the latter looms have a higher power consumption which is especially marked at the narrower widths, which again tends to make production of narrow cloths more expensive.

Table 1

Automatic 4-Shuttle Terry Towel Looms with Dobbies

Width (ins.)	Rate of Weft Insertion (yds./min.)	*Machine Operating Cost (pence per hour)	*Looms per Weaver	Loom Set Cost (pence per hour)
44	177	9·8	20	196
75	239	11·9	15	179
100	278	14·4	13	187

*** Based on same data as Fig. 1, except that stopped time per inch warp space per 100,000 picks = 0·62 min.**

From the data it can be seen that the most economical warp width for Type I machines is in the 45 - 55 ins. region, while for Type II machines, this is above 65 ins. Assuming that the Type II model cannot be used for widths in excess of 85 ins., a heavier and more expensive model of loom will have to be made, with a consequential increase in production costs.

The values of Table I refer to three widths of a 4-colour automatic towel loom, assumed to be fitted with a warp stop motion on both warps, and with dobby shedding. The 44 ins. and 75 ins. widths refer to similar models of loom, while the 100 ins. width is for a heavier machine. Here again, the existence of a lower cost region within the range of warp widths rather than at one end is attributed to the existence of two distinct models of machine. Had one model only been available in these instances, the most economical production would have been encountered with the widest warps.

In general, where one model of machine is available, the headstock cost of which is substantial, the wider machines will be found to give the most economical production although the loom running efficiencies will be lower. This is true, for example, of automatic woollen looms in the width range 72 - 120 ins. and of most looms with jacquard figuring. Since jacquard machines usually limit loom speed, it is obviously sensible to utilise the greatest width of reedspace possible at the given speed. The reduced cost of cards and card cutting with wider looms is also of some importance.

Similar comments apply to the Sulzer weaving machine now available in two models of 85 ins. and 130 ins. reedspace, some details for which are given in Table 2. Here, the freedom to form selvedges at almost any point within the reedspace gives flexibility of cloth width similar to that already noted in connection with wide warp-knitting machines.

Where the machinery maker decides that a single headstock is to be used in conjunction with a relatively wide range of machine widths, users of machines at the narrower end of the range may be substantially penalised. Where centre selvedges can be formed, this is of no consequence, but in other instances there may be a need for cheaper headstocks to be available for narrow, high-speed machines.

Table 2

Sulzer Weaving Machines (Single Colour)

Width (ins.)	Rate of Weft Insertion (yds./min.)	*Machine Operating Cost (pence per hour)	*Machines per Weaver	Machine Set Cost (pence per hour)
85	590	24·6	24	590
130	722	28·1	20	562

*** Interest, depreciation and maintenance, 15%; power 1·4d. per h.p.; floor space at 2s. 6d. per sq. ft. per annum; 5,500 working hours per annum (3 shifts). Stopped time per in. warp space per 100,000 picks, 0·15 min. Weaver works 42 mins. per hour on stopped machines.**

BLEACHING MANUAL. This new, well produced, loose-leaf, published by Laporte Chemicals Ltd., Luton, contains seven sections: general, protein fibres, natural cellulosic fibres, test methods, products and miscellaneous. Bleaching of wool and other animal fibres is dealt with in the first section, along with construction materials for bleaching equipment, handling precautions, hydrogen peroxide bleaching, and technical service. The section devoted to protein fibres is concerned with bleaching with Stabiliser C, steep bleaching process with alternative stabilisers, high alkali method, continuous bleaching of loose wool in the scouring set, bleaching blankets and woollen and worsted yarns with hydrogen peroxide. The next section on cellulosic fibres deals with bleaching cotton cloth in kiers, on the winch, in the package machine and the jig, and with continuous bleaching. Certain sections of this admirable publication are incomplete but as further information is published it will automatically be sent to holders for inclusion in the book. It is, indeed, an extremely useful reference work based on the company's many years of experience in this field.

Production of Carpet Pile Yarns—With Particular Reference to Tufted Carpets

By R. G. CAIRNS, B.SC.(TECH.), P. H. OLIVER, B.SC., and R. A. PARKER, A.T.I.†

THE requirements of carpet yarns are a little different in some respects from those for yarns for normal woven fabrics. For instance, short-term irregularities which show up in the latter will not show up to the same extent in a carpet. On the other hand, a very irregular yarn will affect the twist distribution, which can have its effect on bursting of the pile. The last is an important factor in tufted carpets, since the degree of cover given by the pile yarn depends on this. It should be added that the level of the twist factors used will have considerable bearing on the carpet quality.

Long-term count variations will be important because of the possible effect of streaks in the carpet, though this effect is not usually marked. Other factors are the degree of shedding, either during tufting or subsequently when the carpet is in use, and the accuracy of blending if a blend of fibres with different optical properties or colour is involved.

The spinning system will be expected to have its effects on the resultant yarn in so far as it affects the tufting and some of the subsequent properties of the carpet. Obvious physical differences arising between the systems are the staple lengths employed and the degree of parallelisation of the fibres in the yarn—this being related to the bulk of the yarn. Woollen or cotton condenser yarns have their fibres very much more disorientated than either cotton- or flax-spun yarns.

Opportunity has been taken to compare different processing arrangements within a particular system, for instance, the use of a roller-and-clearer card on the cotton system. The cotton condenser system has not, as far as is known, been used for the production of carpet pile yarns, but, for the purpose of effecting a straight comparison with the other spinning systems, appropriate yarns have been spun. As a woollen carpet set was available, yarn was also produced on this system. Both these condenser-spun yarns provided interesting results.

Details of Trial

The trials were carried out using 15- and 12-den. crimped "Fibro" and spinning to a common count and nominal twist for all yarn systems 2/1·85s c.c. (2/319 tex), 4 t.p.i. for the singles and 3½ t.p.i. for the folding twist. These twists were fixed at a suitable level for the carpet construction used, a level that is satisfactory for the various spinning systems, though, in commercial practice, the long-staple yarn spinners, in general, tend to use slightly lower twist factors.

The yarns were tufted on a 34-in. machine having $\frac{3}{16}$-in. gauge, the number of stitches per in. being 9 and therefore giving 48 tufts per square in. The pile height used was $\frac{3}{8}$ in. Crimped "Fibro" used in this construction gives a good resilient pile to a tufted carpet, and this construction represents a rather-better-than-average standard of commercial carpeting.

Because some of the interest in the comparison was with regard to the efficiency of mixing or blending achieved on the various systems, a blend of $\frac{2}{3}$ matt "Fibro" and $\frac{1}{3}$ crimped "Fibro-Duracol" black was used. For this reason, it was necessary to use 15-den. for the long-staple blend and 12-den. for the short-staple blend as 15-den. 2½-in. staple is available in white only. The following is a summary of the machinery used in the comparison trials and indicates the sequence of equipment used for the different spinning systems.

Short Staple Spinning

(1) Hopper feeder
Intermediate scutcher
Three lap feed
Finisher scutcher
↓
Flat card
↓
Two passages drawing
↓
Sliver spinning

(2) Hopper feeder
Intermediate scutcher
Three lap feed
Finisher scutcher
↓
Flat card
↓
Two passages drawing
↓

(I)	(II)
Can-fed intermediate spinning	Slubber I Intermediate spinning

(3) Hopper feeder
Intermediate scutcher
Three lap feed
Finisher scutcher
↓
Roller card
↓
Two passages drawing
↓
Sliver spinning

l. to r. Mr. M. E. Morton (T.M.M. Ltd., Oldham), Mr. R. A. Rusca, B.Sc. (Southern Regional Research Laboratory, New Orleans, U.S.A), Mrs. Smalley, Mr. E. G. Smalley (Director, T.M.M. Ltd., Oldham), and Mr. A. F. B. Nall (B.S.I.)

† *Courtaulds Ltd., Textile Development Unit, Rochdale.*

Long Staple Spinning

(1) **Jute System**
Hand blending
↓
Hopper feeding
↓
Jute card
↓
Four passages of open gill drawing
↓
Sliver spinning

(2) **Flax-Rove Spinning System**
Hand blending
↓
Hand feeding to flax card
↓
Three passages of open gill push bar drawing
↓
Flax roving
↓
Flyer spinning

(3) **Composite System**
Hand blending
↓
Hand feeding to flax card
↓
Three passages of jute push bar drawing
↓
Sliver spinning

(4) **Mackie Carpet System**
Mechanical blending
↓
Conditioning bins
↓
Hopper feed
—
Modified flax card
↓
Three passages intersector drawing
↓
Gill spinning

The conditions under which spinning was carried out can be applied commercially.

Fibre Breakage

Some degree of fibre breakage takes place on all the systems and most occurs during carding. Numerical comparison between the systems needs to be interpreted with caution, since it is important to consider the relative amounts of fibres in the different length categories. A somewhat arbitrary method of quoting fibre breakage has been used. In the case of nominally 6-in. staple material, the percentage of fibres below 5½ ins. in the card sliver is used and, for the 2½-in. staple, the percentage below 2¼ ins. is used. In this way, the fibre breakage with the longer staples is seen to be between 20% and 35% and, with the shorter staples, it is between 5% and 15% (after allowance has been made for short fibre present in the raw material). On the cotton system, comparison of the roller-and-clearer type of card with the flat card shows the latter to have considerably less short fibre present in the card sliver, presumably, due in part to the removal of some of the short fibre in the flat strips.

On the flax and jute systems, the amount of short fibre in the finisher drawing slivers can be more or less than in the card slivers depending on the type of drawframes used. For instance, using open gills, it was noted that the amount of short fibre had decreased owing to some falling out. On the other hand, with intersector gills, the amount was greater, probably owing to the fibre movement being too restricted by the pins, though there is, in many cases, appreciable fibre breakage, the amount of very short fibre present in most of the yarns is small, and it has little influence on the regularity of such coarse yarns. The effect of some relatively short fibre present in the yarn may have a beneficial effect on the bulk of the yarn, though no direct evidence is available.

Yarn Bulk

The following estimates of yarn bulk in c.c.'s/g. were obtained:—

	Singles	Folded	Folded (relaxed)
Cotton (15-den.)	2·5—3·0	2·9	
(12-den.)	2·4—3·0	2·4—2·7	3·1—3·15
Flax and jute	2·3—2·4	2·4	2·8—3·1
Cotton condenser		3·4	3·8
Woollen condenser		3·0	3·7

These results indicate that the flax- and jute-spun yarns are the leanest, which confirms the common belief. Visually, the leanness of these yarns is more obvious in the unrelaxed state. The condenser-spun yarns have the highest bulk, the cotton condenser being higher than the woollen because, in the former case, they were mule-spun whilst the latter were ring-spun and more straightening of the fibres has occurred.

Cotton-spun yarns made by using one head of drawing tended to be more bulky than those made by using three heads. This was not so obvious with the folded yarns. Tufted carpets are backed after tufting and may also be piece-dyed: these processes allow bursting of the pile. For this reason, some yarn bulk measurements were carried out on yarns relaxed in hank form in a blank dyeing treatment. As a result of relaxation, the difference in folded yarn bulk between the cotton-spun and flax- and jute-spun yarns was reduced.

Discussion of Results

There are several features, which can usefully be summarised, arising from the investigation. Considerable latitude appears tolerable in yarn regularity without being very obvious in the carpets though, as pointed out earlier, its possible effect on twist variation cannot be overlooked. Both long- and short-staple systems are capable of yielding good regular yarns in the coarse counts used, though, in general, the longer-term count variations were found to be rather larger for the long-staple systems.

The blending efficiencies of the flax and jute sets used were inferior to those of the cotton system, with the exception of the new long-staple equipment described, which possesses better blending facilities prior to carding. The latter appears to give excellent results. Fibre breakage, whilst occurring in varying degrees on the various systems, does not appear to be a very serious matter, not materially affecting fibre shedding. However, fibre length and its effect on shedding in the carpet do favour the longer-staple yarns to a noticeable extent.

Conclusions

The results show that no particular spinning system has an all-round superiority in the production of tufted carpet pile yarns, although the new and modified machinery introduced by each type of spinner has enabled yarns of the necessary quality to be spun at high and improved rates of production compared with yarns produced on standard equipment.

Some of the important features which have emerged are as follows:—

(1) The long-staple system possesses the merits of versatility, in that it can spin fibres up to 50-den. alone or in blend, it has high production per operative and, as regards the resulting pile yarn quality, gives little fibre shedding in cut-pile carpets. The shortcomings of this system are the lack of mechanical blending prior to carding, which appears to be overcome in the new Mackie equipment, and the tendency to leanness of the yarns, though this leads to efficient tufting and can be eliminated by after-treatments to the carpet.

(2) The short-staple system possesses the merits of very good blending with the ability to produce acceptable yarns at a reasonably good rate of production and using only a short processing sequence (especially if sliver-to-yarn spinning is adopted).

Automation in Fashioned Outerwear, etc., Machines

By B. A. MONK†

THE development since 1945 of the fully fashioned type of machine for making underwear and outerwear provides an excellent example of the way in which the demands of the garment-producing section of the hosiery industry are being met by the machine makers. Knitting speeds, with consequent greater production of garments, had increased from 40 to 90 courses per min., even before the introduction of the automatic features described in this paper, but it has now been made possible by the provision of automatic mechanisms which can replace the manually operated plant, to have several machines under the control of one operator where formerly he could control only one machine. Increase in production has been accompanied by advances in wages roughly parallel to the corresponding changes in the wages in the fully fashioned fine-gauge nylon stocking section of the industry.

Every possible solution has been studied, with a view to creating a new machine to meet the demand for a fully fashioned outerwear garment at a price comparable with that of the much inferior cut-and-sewn garment. It is a well-known fact that the rib border on outerwear garments is manufactured on a separate machine, and this fact was the first to be investigated with a view to creating both machines as one unit. So many disadvantages arose from a study of this problem that it was rejected as a solution. One objection was that the expensive rib mechanism on the machine would be in use on average approximately only 10% or 12% of the life of the machine, and hence it would be uneconomic. Also, certain operations such as doubling (which is the practice on all good-class garments) are extremely difficult and a separate rib machine would still be required for manufacturing borders for necks in any case.

Hitherto, the operator of the fully fashioned machine had to make the adjustments for such operations as setting the fashioning fingers for the control of narrowing and widening, feeding the rib-transfer mechanism with loaded rib bars, and removing completed parts of garments from the take-up roller. These adjustments took up so much of the operator's time that tending more than one machine was not practicable. Also, the machine had frequently to be stopped so that the necessary adjustments could be made. These two factors alone involved high labour costs for relatively low output and made it difficult for manufacturers to meet competition from such countries as Japan where much lower wages are paid.

The aim, therefore, was to produce machines in which all the operations and changes thereof were completely automatic and governed by a controlling unit that could be pre-set. A proviso, of course, was that there should be no reduction in the standards of quality of output that had for so long maintained the superiority of fully fashioned products over those produced in the cut-garment section of the industry. The automatic machine described in this paper was developed with a view to achieving this aim. High speeds have been achieved by the combination of a heavy machine framework and light cam levers with balancing cams to relieve heavy spring loads. The successful application of a variable draw system takes advantage of the higher speeds when knitting narrow widths. With this is included pneumatic control of the camshaft displacement when fashioning.

For automatic operation, electric motors, switches and solenoids are employed. These are brought into operation in the correct order with accurate timing by the cam drum on which the whole sequence of operations is pre-set. The machine, therefore, runs continuously within a sequence of operations or when changing from a completed set to a new set.

The advance that has been made is due in no small measure to the close collaboration between the garment-producing section of the knitting industry and the machine makers. Such intimate co-operation has rarely existed in the past.

Though the new automatic machine described below is the same size as its predecessors, it differs radically in several respects and the following additional mechanisms are incorporated.

1. Sequence drum, which is the main control for all automatic operations.
2. Automatic bluffing, which is the main control for the shaping and length of the garment.
3. Automatic rack-out, which re-sets the carrier travel to a start position for each set.
4. Bar feed mechanism, which delivers the loaded rib bars into the rib-transfer mechanism.
5. Fabric take-off, which tensions and draws off each garment piece and deposits it in a tray.
6. Dual motor drive, which controls the machine speed accurately through the complete automatic cycle.
7. Yarn-deflecting mechanism.

Each of these mechanisms is brought into operation automatically at the appropriate time and in the correct order.

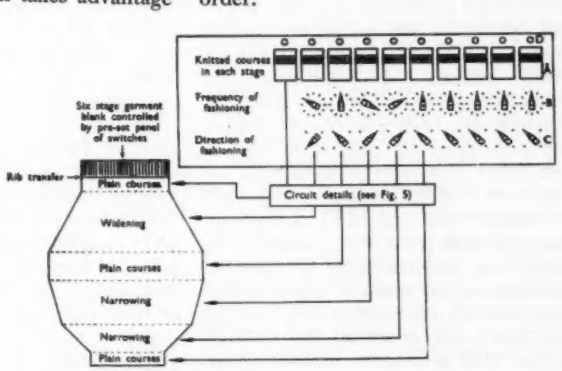


Fig. 1. Control panel for garment shape

† *S. A. Monk (Sutton-in-Ashfield) Ltd.*

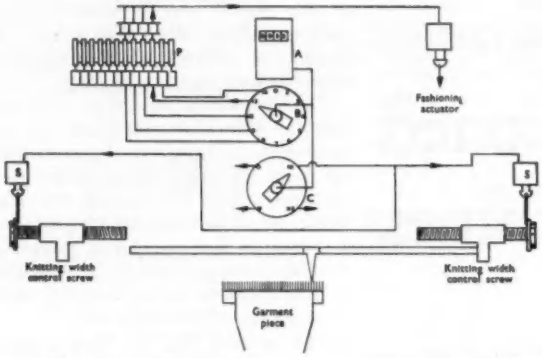


Fig. 2. Diagrammatic circuit for garment shape

Garment Shape Control

Without a method of easily and quickly changing shapes, fashionings and sizes on the garment, much of the value of the automatic features would be lost if only a small number of one particular size or shape had to be made. The fully automatic machine can now be made completely adaptable for even quite short runs of one type. During knitting, fully fashioned outerwear and underwear garments change their line of shape only about eight times, that is to say, the machine controls are changed only about eight times during knitting.

The basis of the device is the use of predetermined course counters (see A, Fig. 1) which can be set at intervals, progressively at the correct intervals between the groups of plain courses, widenings and narrowings, etc., to operate the fashioning screw bluffs, frequency of fashionings and other relevant controls. Underneath each course counter are seen two rotary switches. The top one has 12 positions indicated by a dial, B, which reads zero to 14, omitting numbers 11 and 1, representing the frequency of fashioning. The bottom switch has four positions indicated by a dial, C, which reads zero, widen, narrow 1, narrow 2. Above each course counter is a signal lamp, D, which glows each time a course counter has counted its predetermined number of courses, showing clearly to the machine operator from a distance the progress of the set being knitted. A push-button is provided on the unit for manually resetting the course counters back to the predetermined figure ready for the next set. This control is for use on machines which are not completely automatic. On the fully automatic machine this resetting operation is carried out automatically. The course counter on the extreme right is for stopping the motor in the case of the semi-automatic machine. In the case of the fully automatic machine, this course counter triggers off the automatic sequence of events at the end of one set and the beginning of the next.

Operation of the device is as follows (see Fig. 2): the digit wheels on the course counters, A, are easily adjustable to read any desired figure. When that figure has been achieved by the machine knitting that number of courses, a built-in switch is operated and causes a relay to close and feed a current to the input of the two switches, B and C, mounted below the course counters. If the switches are set at zero, no fashioning will take place: if the switches indicate a fashioning instruction, the machine will carry out that instruction until the adjacent course counter has operated its relay. The relays are interlocked so that only one can operate at a time. The output current feed from the upper switch is taken to a pulse unit, P, which gives frequency of dipping of the narrowing machine. The lower switch output current is taken to solenoids, S, which control the rack end bluffs.

In practice, the control panel may be set up from a given statement in about two minutes and will require no further attention until that style or size is completed. The absence of chain, rods and bowden cables gives the machine a very clean appearance. The electrical gear used is of the simplest nature requiring a minimum of maintenance, and the system can be readily understood by the factory mechanic. It can be stated positively that one operator who formerly controlled a machine of 12 knitting heads with difficulty and no spare time, could, with the new devices, be responsible for at least 32 heads with much less fatigue.

Textile Institute Conference

Take-Up Machinery

By J. V. KEITH†

WITH the advent of synthetic fibres, a demand has grown for a type of machinery known as "take-ups." Whether the material be melt spun, dry spun or wet spun, there is a need for a packaging operation at the end of the process. There is also an increasing number of special operations that require take-ups, such as draw stretching, bulking of nylon carpet yarn, plastic coating of glass yarn, manufacture of ribbon and tapes, extrusion of plastics, etc.

Conventional twisting machines are excellent examples of two of the simplest forms. On an uptwister, the drive roll, reciprocating guide and bobbin constitute a take-up machine. On the down-twister, the ring, traveller and spindle mechanism constitutes a take-up machine. These two basic mechanisms control the yarn speed by entirely different principles. On the uptwister, the yarn is pulled from the revolving spindle at a constant yarn speed established by the speed of the drive roll. On the downtwister, the yarn is delivered at constant yarn speed to the take-up mechanism by the feed rolls of the twisting machine. The take-up mechanism winds the yarn on to the bobbin at a yarn tension established by the traveller weight.

New Precision-Winding Take-Up Machine

Any winding machine can be converted into a take-up machine by the application of the necessary control means. Early in the development of tension-control take-ups, it became evident that the existing precision-winding machines were inadequate for many of the take-up requirements regardless of the type of tension control used.

To meet the demands of the textile industry, a new precision-wind take-up

† *Universal Winding Co.*

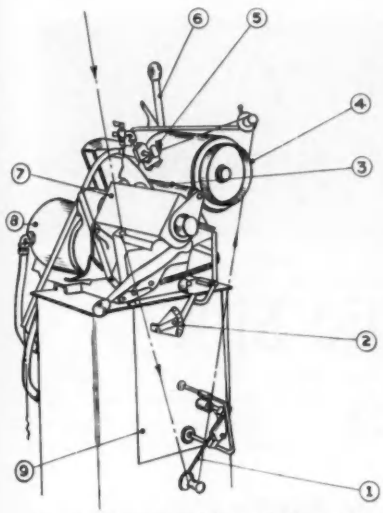


Fig. 1. New precision winding take-up machine. Thread line indicates position of thread at start of automatic thread-up. (1) Compensator arm. (2) Tension adjustment. (3) Roller bail. (4) Automatic threading hub. (5) Aspirator and cut-off device. (6) Doffing handle. (7) Traverse cam housing. (8) Drive motor. (9) Control panel

machine has recently been placed on the market. The machine has been designed to achieve the utmost in flexibility, productivity and long trouble-free operating life. It can be furnished with the d.c. drive, the torque motor autotransformer control or the torque motor magnetic amplifier control.

The machine is available in two basic types, namely, roller bail and positive pressure. With both types, the machine works on a principle in which the traverse mechanism remains stationary and the spindle moves away from the traverse on a pivoted member as the package builds.

The roller bail type head uses a roller bail attached to the traversing mechanism to sense the package growth and, along with various other components, controls pressure to its proper degree. It is ideally suited to most take-up applications.

The positive pressure type head uses power to position the package constantly in accordance with an anticipated and predetermined build pattern. With its almost infinite number of settings, pressure can be controlled to any degree and can be held to an absolute minimum needed for package formation. Hence, this type is ideally suited to very delicate fibres and where control of denier is kept within close limits.

Located on the tension-control panel, installed below the winding head, is the yarn-sensing element or compensator arm. Its position controls the amount of power supplied to the motor. The yarn tension is independent of the compensator arm position. This means reasonable line voltage changes, or any upset of the control system can be tolerated without affecting yarn tension an appreciable amount.

The positive pressure type head uses power to position the package constantly in accordance with an anticipated and predetermined build pattern, and hence the tension applied to the yarn. The machine has been designed substantially with rugged cast iron construction throughout the winding head and with a heavy spindle and bearings to assure precise, smooth operation at high speeds. The machine will accommodate packages of 30 lbs. of nylon or dual packages on its single spindle.

The ability to wind two packages makes possible the solving of take-up problems in many instances where flat yarn take-ups have been prohibited by their head-to-head centre distance spacing. This means, with the machine's 12-in. minimum centres, that 6-in. spacing on spinning machines may be accommodated.

The entire drive between machine components uses timing belts and sealed ball bearings. Thus, a very friction-free, responsive system is realised with low power loss and with no lubrication requirements. Lubrication of other portions of the machine is confined to a very infrequent oiling of the traverse cam with its oil well and wick system and to common linkage and pivot points.

The traverse cam, housed in its own case, is of the multiple-turn type using a dual groove with a roller for end turns and shoe for cross-overs. The small mass of the guide and follower, made possible by placing the cam face-to-face with the package, permits operation at higher speeds without high wear-producing impact and noise.

A major feature of the machine is the automatic threading arrangement which is available for continuous spinning or process applications. This device, consisting of a yarn aspirator, automatic threading spindle hub and cut-off device, makes it possible to doff and thread up new packages "on the fly" and automatically. Waste yarn is held to a minimum. An acceleration device permits the machine to reach a speed synchronous with the yarn in the least time. Further, the aspirator and threading system saves operator time by eliminating feed-roll build-up and subsequent stripping. The yarn-catching device in the spindle nose piece is easily adjusted for pick-up of the yarn at the desired speed. The automatic threading feature is available for threading simultaneously two strands to their respective packages on dual-package machines.

Machinery Selection—Future Requirements

The selection of take-up machinery depends on the relative importance of the many factors entering into the average application. For example, the operating yarn speed has a direct effect on the investment cost per lb. of yarn. Thus, there is the obvious desire to operate at the maximum possible speed. Yarn tension and yarn quality are factors that usually must be met even at the expense of yarn speed. Type of package and package size are not only important economic factors directly related to the cost of production, but may also require weighing relative to a product's competitive position and customers' acceptance of the product in the form and size provided.

There are also the peculiar properties associated with a given process that influence take-up equipment design. Examples are the constriction of nylon 6·6 when packaged at draw-stretching or the coefficient of friction of glass yarn filaments that makes handling of the glass yarn difficult during spinning take-up.

The textile industry is continuously demanding machines capable of operating at higher take-up speeds and producing larger packages. This trend, especially for the heavier-denier yarns, must eventually lead to the development of automatic and semi-automatic machinery.

The development and production of such machinery is expensive. It is unlikely that it can be undertaken by the machinery manufacturers without some assistance from the yarn producers or without the assurance of a market of reasonable size. Most yarn producers have been inclined to develop machinery of this type themselves, feeling that the need for secrecy and the productive advantage over their competitors justified the high cost. The result is a duplication of effort, a high unit cost for machinery, and a waste of manpower.

Would not the whole textile industry profit by co-operative development programmes between the yarn producers and competent textile machinery manufacturers, taking advantage of the latter's tremendous wealth of "know how"?

TEXTILE MACHINERY and MILL EQUIPMENT NEWS

Re-Designed Automatic Silk and Rayon Loom

Starting handles at both sides, pedal-operated shuttle ejectors and power reversing motion are some of the important new features

IN recent years one notable feature in textile machinery design has been the trend towards "low-built" loom construction. From the standpoint of purely visual appeal, this form of construction is certainly more pleasing than the traditional loom with its topheavy superstructure but, like all good industrial design, the improved appearance stems largely from the application of sound engineering principles.

There are two main advantages of the new type of construction. In the first place the centre of gravity of the loom is lowered appreciably, thus reducing vibration and, therefore, wear on moving parts—and allowing higher running speeds. Secondly, the absence of superstructure means that the warp is well lit and completely visible to the weaver; all, or nearly all moving parts are below the warp line, thus reducing the risk of soiling and, not least important, conditions in the weaving shed are appreciably improved.

An interesting example of the new construction is the 382 Model silk and rayon loom made by George Hattersley and Sons Ltd., whose looms have been well known in the silk and rayon trade for the past thirty-five years. The loom has now been completely re-designed to incorporate the most modern developments in weaving technique and modern engineering practice, while at the same time retaining the well-proved basic principles of the loom. It is jig-built and finished to very fine limits to give the accuracy essential in weaving fine filaments at high speeds,

A foot pedal at the battery side instantly operates the power reversing motion

Swell release handles reduce pressure so that shuttle is quickly inserted in the box

Another foot pedal is employed to (a) rapidly eject the shuttle or (b) pick it through the warp shed

to minimise wear and to make the replacement of worn parts much easier.

The improvement in running speeds mentioned above has been easily achieved with the new 382 Model and the makers quote, as conservative estimates, a range of running speeds from 200 p.p.m. on a 45-in. reedspace model to 170 p.p.m. on the 69-in. model. The well known versatility of the loom has been retained in the re-designed version and, in addition to the several systems of weft insertion by George Fischer mechanisms, there is a wide variety of other loom motions suitable to meet any requirements.

In the re-designing of the loom, particular attention was paid to the problem of operative fatigue. It is a well established fact that, other things being equal, the maintenance of a high standard of cloth quality depends to a great extent on the degree of alertness of the operative. In the design of the 382 Model the aim has been to minimise physical effort on the part of the operative so as to reduce weaving faults and also to allow more looms per weaver.

The features incorporated to give greater operative convenience are shown in the accompanying pictures, from which it will be seen that particular attention has been paid to the siting of handles and pedals. Starting handles are provided at both ends of the loom and swell release handles are provided so that pressure on the swells can be reduced for easy insertion of the shuttle. Shuttle ejectors, operated by a foot pedal at each end of the loom, allow the operative to withdraw the shuttle from the box, or pick it across the shed, without using her hands or possibly soiling the fabric.

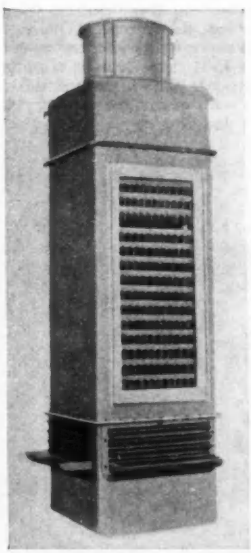
An important motion fitted to the loom is the power reversing which is designed to eliminate setting up places in the cloth and reduce stopped time while unweaving faults. A foot rail is fitted across the front of the loom which, when depressed, releases the brake, disengages the picking, reverses the take-up and runs the loom, dobby and box motions in reverse for as many picks as required.

Packaged Water Cooling Tower

AN interesting new development in modern water cooling technique is the production of a complete packaged cooling tower small enough to be transported in a light lorry. It has been designed by Film Cooling Towers (1925) Ltd., Lionel Road, Kew Bridge, Brentford, the well-known specialists in water cooling methods and has a basin, shell and splash tray made of resin bonded glass fibre, a construction which while contributing to the lightness of the unit, eliminates the necessity of protective painting.

The tower operates on the induced draught principle; the fan and motor mounted on the canopy, expel the air from the top at high velocity. Cooling air entering at the foot at a relatively slow speed is circulated evenly over the base area and throughout the interior of the tower. The packing providing the maximum possible heat transference in a small space, is composed of a number of horizontal trays of parallel laths, each layer being at right angles to the trays immediately above and below it. The water is discharged from spreader troughs which run along the entire length of the tower and it flows down the grid packing changing direction through 90° in every 2 ins. down the whole depth of the tower. A continuously changing film of water meets the ascending air without obstructing its course and as no drops are formed, the loss of water by entrainment is negligible. The internal packing of impregnated timber is proofed against attack by wet, dry and soft rot organisms.

The unit is supplied ready for immediate operation merely requiring to be coupled after the ground has been suitably levelled. Since the pond basin is an integral part of the tower no concrete or steel tank and foundations are necessary. Provision is made for anchor bolts for use when installed on a roof top or in any location where high wind forces prevail. Built-in lugs are provided for crane slings. The packaged cooling tower, which can be supplied in an attractive range of self colours, requires practically no maintenance and operating costs are therefore reduced to a minimum. Capacities range from 300 to 5,000 gall./hr.



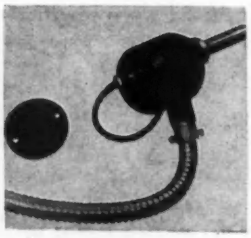
Packaged cooling tower

New Industrial Proximity Switch

MAXIMUM flexibility is claimed for the new capacitance operated controller marketed by Thomas Industrial Automation Ltd., Station Buildings, Altrincham, Cheshire. Known as the "Leveltron" it incorporates a continuously variable differential control enabling site engineers to choose from a wide differential range of 1 - 40 p.f., by adjustment of two simple controls. The first sets the control point of the relay whilst the second varies the reset point without affecting the control point setting, so fixing the differential as required.

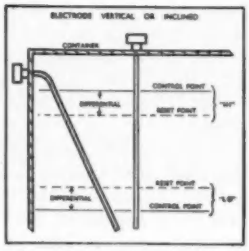
A new standard of sensitivity is said to

"Leveltron" heavy industrial model CS100/C/H



Standard electrode head simple plug-in connection

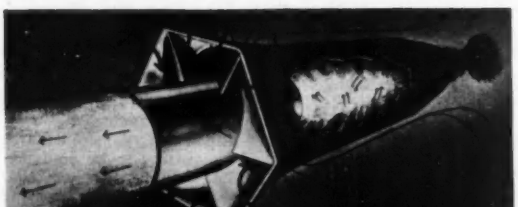
have been established; improved circuit design and careful layout being directly responsible for this. The relay current is "triggered" to provide a snap action of the relay and to eliminate "chatter" or "creep." The three basic instruments in the range are (*a*) general purpose, (*b*) heavy industrial and (*c*) remote control, each with a choice of supply of 110, 240 or 440 v. a.c., 40 - 60 c.p.s. Remote control facilities are available, allowing measurement up to 60 yds. from the point of detection. A new transmission system minimises the increased non-working capacitance of the greater cable lengths.



Schematic drawing of variable differential control, 1-40 pF.

Dust Collection Plant

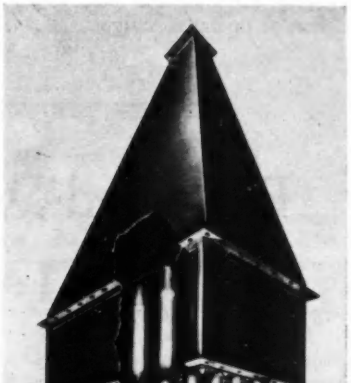
THE SPA collector, manufactured by Steels Engineering Installations Ltd., Sunderland, one of the Steel Group of companies, comprises a number of standard elements housed within a fabricated steel body with dust collecting hopper. The number of elements is varied to meet the volume requirements of each application. Separation of the entrained particle is carried out in one operation within the collector elements.



(left) Dust-laden gas enters the S.P.A. element over the hexagonal face. Here, it is caused to rotate and accelerate by the vanes. The dust is then centrifuged to the outside and the cleaned gas passes out through the inner element

Each element comprises an inner and outer member assembled co-axially. The outer member is formed in two parts: an operating zone and a cylindrical collector tube, the two being welded together. The inner member comprises a straight length of mild steel tubing, flanged at the top, passing centrally through the operating zone, co-axial with the collector tube and extending a little below the bottom of the operating zone. Within the annular space formed between the operating zone wall and the inner member, are placed six guide vanes, these vanes being welded to the inside of the operating zone only.

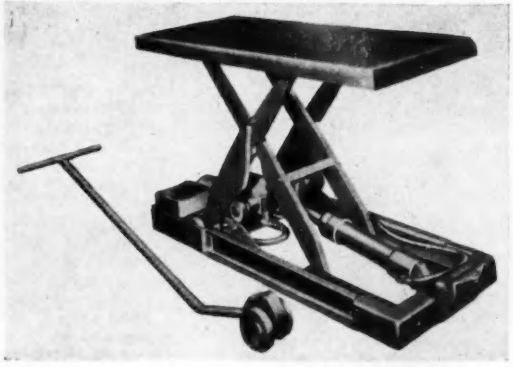
Dust laden air enters the element over its hexagonal face at low velocity. The guide vanes immediately deflect it into a helical path and as it passes through the nozzle, it is rapidly accelerated along this helical path by virtue of the decreasing cross sectional area. The air emerges from the operating zone at a velocity of six times that at which it entered. It flows approximately two-thirds of the way down the collector tube in this helical path before reversing up the central core of the vortex to leave the element through the inner member. The separated dust flows down the walls of the open ended collector tube to be deposited in the hopper beneath.



A cut-away view showing the S.P.A. standard elements in a fabricated steel housing

Reduce Handling and Increase Efficiency

THE "Atlas" lift table is the result of a thorough survey of the materials handling problem in many industries. Designed to meet a need for equipment which would keep materials at correct working height, the illustration shows it is invaluable for numerous industries. The machine is easy to install, economical to maintain and inexpensive to operate. The minimum closed height 7¼ ins. enables



The electro-hydraulically powered "Atlas" lift table

it to fit under the legs of any standard pallet, yet it may be raised to a convenient working height with easy access from all four sides of the load.

This powerful portable lift is small enough to easily fit between the legs of any standard skid, yet it may be raised to a convenient working height with easy access from all four sides of the load. The structural features provide for smooth, uniform rise with full capacity throughout stroke. Each unit is independently powered and controlled by an electro-hydraulic pump and motor. The lifting motion is accomplished through a rugged hydraulic cylinder powered scissors-type linkage. The cylinder, oil reservoir, pump and ½ h.p. electric motor are all mounted within the base, thus concealing the entire lift assembly beneath the platform. It is built to stand hard usage. A portable model of the lifting table is equipped with fixed wheels, a pull plate, and an easily detachable skid spotter or dolly. The table will elevate 30 ins. The collapsed height of the assembly is 7¼ ins., bringing the extended or elevated height to 37¼ ins. A three-position double lever foot switch does all the work: 1—raise, 2—hold, and 3—lower. Full particulars will be gladly supplied by Tipton Welded Fabrications Ltd., Great Bridge Street, West Bromwich.

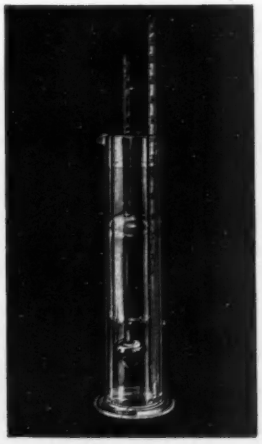
Testing Water for Chloride Content

IN order to be able to prevent boiler water from becoming unduly concentrated it is advisable to have the means of estimating the chloride contents of both the feed and boiler water. The troubles caused by priming, foaming and corrosion of non-ferrous fittings can thus be avoided by blowing down in good time. A quick method of arriving at such an estimate is provided by the chloride testing set produced by the Paterson Engineering Co. Ltd., 129 Kingsway, London, W.C.2. The feed water is tested by adding two drops of potassium chromate indicator to 70 mls. of feed water in the porcelain basin provided and then adding silver nitrate solution from a special burette until a permanent pink colour is obtained. The number of millilitres of silver nitrate used is equivalent to the concentration of chlorides as chlorine in grains per gallon and the conversion to sodium chloride is effected by multiplying this figure by 1·65.

To test the boiler water a very small quantity such as 7 or 10 mls. is used. Two drops of phenol phthalein indicator are added and the alkalinity is neutralised by adding sulphuric acid until the colour is just discharged. The same procedure as for the feed water is then followed and the burette reading is multiplied by 10 if 7 mls. of water or by 7 if 10 mls. of water have been used, the resultant figure representing the grains of chlorides as chlorine in one gallon of water. The chlorides in the boiler water divided by the chloride content of the feed water indicate the concentration of the boiler water.

The approximate total of soluble solids contained in a sample of boiler water can also be rapidly ascertained by means of a hydrometer produced by the company. The sample is cooled to 60°F. and is thoroughly mixed before filling the hydrometer jar. A reading is then taken from the hydrometer and after correcting it for temperature variation, ascertained with the thermometer also provided, it is multiplied by 7·8 the product being grains per gallon of total solids. When the hydrometer is used in conjunction with the chloride testing set the approximate composition of the total soluble solids in the water can be calculated.

Full details are available from the manufacturers at 129 Kingsway, London, W.C.2.

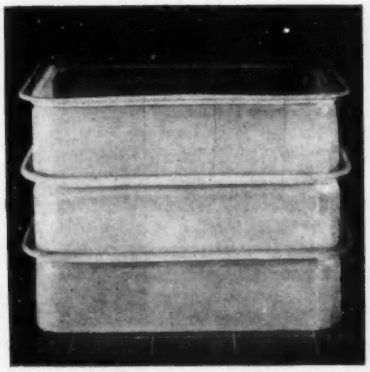


Hydrometer and thermometer in jar

Two New Polythene Containers

TWO new models have been added to the range of "Engel" moulded polythene containers available from White Child and Beney Ltd., Shepley Works, Audenshaw, nr. Manchester. The Model 538—a 20-gall. bin—available in flexible or high density (rigid) grade polythene, is designed with a square body thus occupying the minimum space for the capacity provided, but with a round plinth base so that the bin may be moved by rolling when heavily loaded and giving a step at the base inside which can be adapted for drainage.

The Model 515—a stacking tray, 24 × 14 × 6 ins. approximately, also available in flexible or rigid grade polythene, has an undercut lip around the mouth of the box which provides a true locking stack when the next container is placed on top. Runners are moulded into the base so that the boxes may be used on conveyors, and rigidity and resistance to twist is assisted not only by the runners but also by the deep rolled rim and the undercut stacking ledge.



The 515 stacking tray

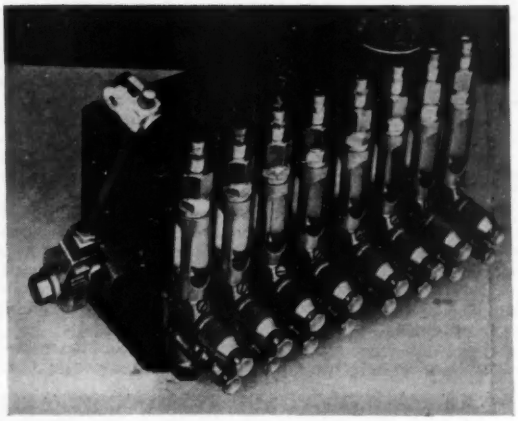
The 538, 20-gall. bin

New Range of Mechanical Lubricators

A NEW mechanical lubricator, the DP 60 announced by C. C. Wakefield and Co. Ltd., 46 Grosvenor Street, London, W.1, can be supplied in a range of sizes to give from 1 - 32 feeds. It is a precision instrument which feeds oil at a pre-determined rate and in pre-determined quantity to the frictional surfaces of a machine. The lubricator is normally actuated by the machine and the oil supply automatically commences and ceases with the movement of the machine. The human element is thus kept to a minimum and efficient lubrication is combined with economy in oil consumption. The DP 60 has two interesting features:—

(1) The usual sight feed glass which withstands pressures up to 600 p.s.i. is replaced by a perspex tube and metal shroud capable of withstanding 2,000 p.s.i.

(2) The oil reservoir is of welded steel construction which in an eight-feed lubricator, effects a weight saving of as much as 29 lb. over the usual cast iron type of reservoir.



This DP 60 mechanical lubricator has 8 feeds, each regulated separately from zero to maximum

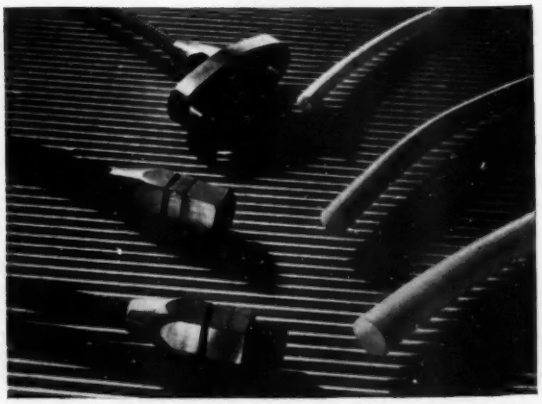
Each feed can be regulated from zero to maximum by a regulator screw at the front and each feed has a separate flushing plunger operating independently of the pump plunger. Full flushing feed can therefore be obtained irrespective of the position of the pump plunger. An air vent screw is provided to each feed to disperse air locks should they occur when pumping commences. Each pump unit can be removed and replaced in one assembly. The new lubricator can be readily applied for the forced feed lubrication of a wide range of machinery.

"All Purpose" P.T.F.E. Flexible Hose Assembly

A RECENT development in the flexible hose industry may soon replace in many fields the conventional rubber and metallic flexible hose. Despite its light weight construction P.T.F.E. is claimed to outlive conventional metallic and special rubber hoses even under the most arduous flexing duties. It possesses an extremely small bending radii (e.g. 1 in. on the $\frac{1}{4}$ in. bore tube and $\frac{1}{2}$ ins. on the $\frac{1}{2}$ in. bore tube). With an extremely low coefficient of friction, which means that it is virtually self lubricating, P.T.F.E. tube provides for a rapid and smooth evacuation of the conveyant. On certain steam presses P.T.F.E. flexible tubing is said to have achieved well over a million and a quarter movements and the assembly has been unmarked and still fit for further service.

Steam one moment—oil the next and perhaps water; all can be safely carried by one hose where previously three were often required. Providing the hose is cleansed thoroughly P.T.F.E. tubing will convey a multitude of liquids. Outwardly the P.T.F.E. tube is usually protected with closely woven wire braiding and asbestos sheath for insulation can also be provided.

P.T.F.E. hoses possess an extremely wide working temperature range of —80°C. (176°F.) to 250°C. (485°F.) although under certain circumstances it can remain serviceable at temperatures as high as 300°C. (572°F.). Throughout the whole temperature range it retains its toughness and has exceptional weathering qualities. Pressures depend very much on the bore size required. For example on a $\frac{1}{4}$-in. bore P.T.F.E. hose a working pressure of 5,000 lb. s.i. can be achieved whilst a 1-in. bore up to 2,500 lbs. s.i. can be reached. At the expense of flexibility very high pressures can be achieved by multi-braiding and some P.T.F.E. hose assemblies have reached 20,000 lbs. s.i. From $\frac{1}{8}$ up to 1-in. bore in rod and flexible tube can be provided and sizes above this limit can be specially produced. After exhaustive experiments William Rose Ltd., Hilyn Works, Lockfield Avenue, Enfield, have produced a simple but robust re-usable fitting which can be offered in a variety of metals including brass and stainless steel. Re-tubing can in an emergency be carried out by the user but in any case the fittings can always be returned to the manufacturer for immediate repair.



Manufactured from a variety of metals, these robust fittings enable the user to retube in an emergency

THE TEXTILE
COLOURIST & FINISHER

Replacing Urea and Melamine Resins for Crease-and Shrink-Resist Finishes

A review of recent progress towards the production of finishes which offer possibilities in lower strength loss and an absence of chlorine retentivity

By B. C. M. DORSET

AFTER thirty years' experience in the application to cellulose fibre materials—such as cotton and viscose rayon—of aminoplasts, i.e. thermosetting resins resulting from condensation of formaldehyde with urea and melamine, for producing durable crease- and shrink-resist finishes it is now well known that certain disadvantages are encountered. Some of these disadvantages are associated with the conditions of finishing which have to be observed in order that the desired modified properties of the fabric can be secured while others arise directly from the chemical nature of the resins themselves. Thus, the acidity and temperature conditions required in the curing stage produce a weakening of the textile material while the fact that the resin is nitrogenous in composition gives it a capacity to absorb chlorine during subsequent laundering of the finished fabric where a hypochlorite is used for whitening purposes and may so lead to a severe weakening and yellowing during later hot ironing treatments. The disadvantages arising from chlorine retentivity have been widely discussed and it would seem a defect likely to be met with so long as a nitrogenous resin is employed. For this reason a modern tendency is to turn away from urea- and melamine-formaldehyde resins and to use non-nitrogenous substances which are non-chlorine retentive and yet able to produce comparable finishing results. It is under such circumstances that the Quaker Chemical Products Corporation in America (this company was originally occupied in promoting the production of chemicals which could be made from by-products incidental to the manufacture of Quaker oats) have carried out extensive research which has shown that certain acetals can with advantage be used instead of the urea- and melamine-formaldehyde resins mentioned and so produce crease- and shrink-resist finishes attractive because they are free from some of the disadvantages mentioned while possessing distinctive advantages. Certainly the finishes produced with acetals (these are non-nitrogenous compounds) are non-chlorine retentive.

The acetals are a well-known type of organic compound readily made by reacting two molecules of an alcohol with one molecule of an aldehyde such as formaldehyde or acetaldehyde in the presence of an acid or a metal halide catalyst. Calcium, boron, and ammonium chlorides are useful catalysts for this type of reaction which can be illustrated by reference to the formation of the acetal from acetaldehyde and ethyl alcohol (Fig. 1).

A large number of different acetals can be made by varying the aldehyde and alcohol reactants and it is possible

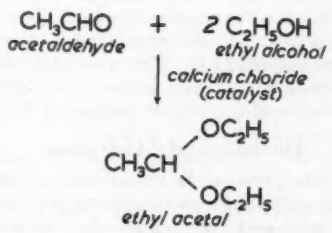
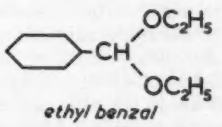


Fig. 1

to prepare mixed acetals by reacting any particular aldehyde with a mixture of alcohols. Aromatic aldehydes, such as benzaldehyde, may be used instead of an aliphatic aldehyde so that if, for example, benzaldehyde is employed then from its reaction with ethyl alcohol ethylbenzal results having the formula set out in Fig. 2.

Fig. 2



From the viewpoint of using these acetals in crease- and shrink-resistant finishes on cellulose fibre materials it is obviously necessary to prepare a large number of acetals and then select for large scale use those most easily and cheaply manufactured and impart the desired finishing results. Apparently this has been achieved by the chemists of Quaker Chemical Products Cor-

poration so that acetals are now available for commercial application.

Two main types of acetals for the treatment of cellulose fibres have so far been shown useful—the glycol acetals (including modified glycol acetals) and the pentaerythritol acetals. The latter are at a later stage of development than the former. It is believed that the glycol acetals react by cross-linking the cellulose molecules while the pentaerythritol acetals not only effect cross-linking but also form within the fibres insoluble polyacetal polymers.

A typical glycol acetal is that made from diethylene glycol and formaldehyde as shown in Fig. 3. It will be

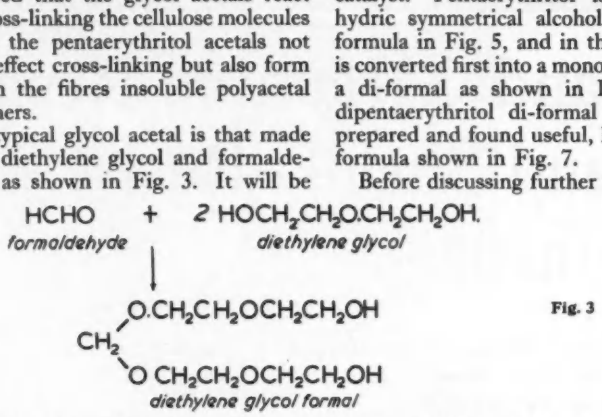


Fig. 3

observed that although such compounds are generally termed acetals they are more particularly termed formals when made from an alcohol and the aldehyde formaldehyde. Acetals are more particularly made from acetaldehyde. The nomenclature of these compounds is thus definitely related to the aldehyde employed.

Alcohols and Aldehydes

It is further to be noted that acetals of considerable molecular weight can be prepared by using the higher aliphatic alcohols and also by using the

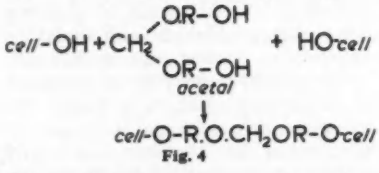


Fig. 4

higher aliphatic and aromatic aldehydes. Thus aldehydes containing up to nine carbon atoms such as succinaldehyde, adipaldehyde, terephthalaldehyde, etc., can be used. When these substances are applied to cellulose fibres in the presence of a suitable acid catalyst cross-linking of the cellulose molecules is effected as indicated in Fig. 4, but there also takes place a breaking down of the acetal so that the resulting fragments take part in the cross-linking.

The pentaerythritol acetals (formals) now being investigated are prepared by the usual method in which say formaldehyde is reacted with pentaerythritol in the presence of an acid catalyst. Pentaerythritol is a polyhydric symmetrical alcohol with the formula in Fig. 5, and in the reaction is converted first into a mono- and then a di-formal as shown in Fig. 6. A dipentaerythritol di-formal has been prepared and found useful, having the formula shown in Fig. 7.

Before discussing further the finishing possibilities of these acetals and the special advantages offered over urea- and melamine-formaldehyde resins the following applications to cotton fabric are interesting. In the first (U.S.P. 2,785,947) the acetal employed was prepared by reaction of diethylene glycol (1 mole) with paraformaldehyde (1 mole) in the presence of 0·001 mole of sulphuric acid as catalyst, and toluene as a diluent. A viscous liquid is obtained which is crystallisable to a solid containing four

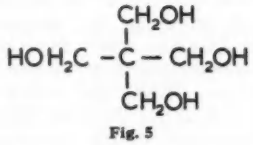


Fig. 5

diethylene glycol residues in its molecule so as to have the formula given in Fig. 8. Cotton sheeting was padded with a liquor containing 7½% of the acetal (formal) and 0·8% ammonium chloride with a liquor pick-up of about 100%. It was then dried to have a residual moisture content of 11%, then calendered at 400°F. under a pressure of 5 tons/sq. in. It was next cured at 300°F.

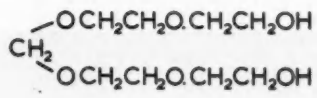


Fig. 8

for 5 mins., washed and dried. The result was a highly lustrous finish of considerable permanence since it was only slightly reduced by soaping at the boil. The finished fabric also possessed an increased resistance to creasing and showed no chlorine-retentivity when treated with hypochlorite bleaching liquor.

Finishing Effects

In the second example a lightweight spun viscose rayon gaberdine shirting was given good dimensional stability during repeated laundering (B.P. 780,043) by treatment with the acetal di(2-methoxy-ethoxy-ethyl) formal having the formula given in Fig. 9.

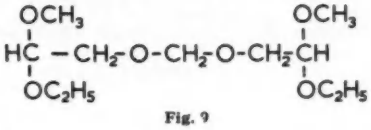


Fig. 9

The de-sized fabric was padded with a liquor containing 8½% of the di(2-methoxy-ethoxy-ethyl) formal, 0·6% sodium sulphate, 2·4% sodium bisulphate, and 88½% water, so as to maintain a 100% liquor pick-up. The fabric was dried at 80°C. on a pin-stenter at the dimensions it had before impregnation and then cured at 157°C. for 5 mins. with no shrinkage allowed in this stage of treatment. The efficacy of this shrink-resist finish can be judged by the data (Table 1) obtained in washing the finished and the untreated fabrics together by a standard procedure. It was found also that the fabric substantially retained its original strength following the acetal treatment.

In considering the finishing effects obtainable by the use of acetals instead of urea- and melamine-formaldehyde and related resins with cellulose fibre materials it is useful to refer to information given by Irvine and Kress of Quaker Chemical Products Corporation in a recent paper (Text. Research J., 1958, **28**, 148). The various effects of such a finishing

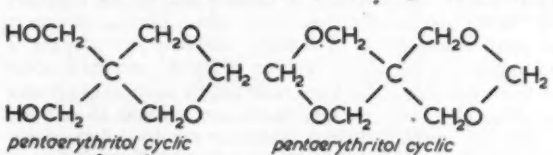


Fig. 6

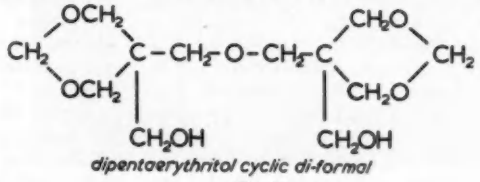


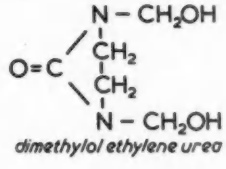
Fig. 7

Table 1

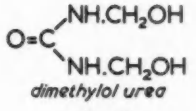
Fabric	Total warp shrinkage (ins. per yard length)	
	1 wash	5 washes
Untreated ..	2·6%	5·5%
Finished ..	1·7%	1·8%

treatment on the physical properties of cotton fabric are summarised here and in comparison with similar finishes obtained with the aid of resins derived from urea-formaldehyde and dimethylol ethylene urea.

(1) The chemical nature of acetals is such that they cannot pick-up and retain chlorine from a hypochlorite liquor. This stems from the essential fact that the acetals are non-nitrogenous. A urea-formaldehyde resin readily picks up chlorine such that the resin-finished fabric yellows and loses considerable strength when hot ironed. By contrast cotton fabric finished with dimethylol ethylene urea does not immediately after finishing show more than a very small chlorine-retentivity but it has been noticed that it steadily acquires an increasing chlorine retentivity during repeated laundering and this may be so marked as to make the fabric much more susceptible to yellowing and loss of strength in hot ironing than a comparable fabric finished with a urea-formaldehyde resin. The difference between these finishes with dimethylol ethylene urea and urea-formaldehyde must lie in their formulae difference as shown in Fig. 10.



dimethylol ethylene urea



dimethylol urea

Fig. 10

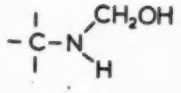


Fig. 11

It is believed that chlorine retention in a urea-formaldehyde resin arises from the presence of a free hydrogen atom attached to each of the nitrogen atoms, i.e., to the presence in the resin of the chemical grouping given in Fig. 11. This grouping is entirely absent in the dimethylol ethylene urea cyclic structure due to the ethylene residue linking the two nitrogen atoms as shown in the formula for dimethylol ethylene urea. But since a cotton fabric finished with this substance is not entirely non-chlorine retentive it is believed that during the curing stage a slight degree of decomposition of the dimethylol ethylene urea occurs to give a product as indicated in Fig. 12 with a

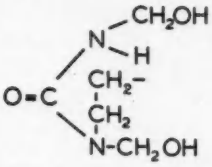


Fig. 12

free hydrogen atom attached to one of the nitrogen atoms thus giving the finished fabric a slight chlorine-retentivity. During subsequent laundering it is possible for this breakdown of chemical structure to continue and thus the increasing chlorine-retentivity of the fabric as produced by repeated laundering can be explained. It is considered, therefore, that the property of cellulose fibre fabrics finished with acetals to be immune to chlorine retentivity constitutes one of the main advantages obtained by the use of acetal compounds in textile finishing.

(2) To a more or less degree the various resin-finishes lack permanency, in so far as the resins left within the finished fabric can be removed by repeated laundering. Those resins deposited simply between the fibre molecules and without any chemical combination with these are the more liable to removal by the chemical and mechanical actions taking place in washing and with the progressive removal of such resin the fabric gradually loses its crease-resist or shrink-resist finish. Fabrics finished with resins or reactants which become fixed in the fibres largely by chemical combination with these resist removal in washing to a greater extent so that the finish is more permanent. But even with these reactants it is possible for hydrolysis to occur during more drastic treatments, particularly by hot acid treatments, and thus make the removal of the fixed resin easier. It is a very important point, therefore, that the combination of an acetal with a cellulose fibre is exceptionally highly resistant to hydrolysis so that only by a treatment which is highly destructive to the fibres themselves (i.e., a treatment which would not normally be applied to the finished fabric) can the finish be destroyed. Acetal finishes can thus be considered highly permanent.

(3) Resin finishing of a cotton fabric can produce a yellowing the extent depending on the nature of the resin applied. It is not easy to destroy this yellowness and so it is highly desirable that the resin applied should be of a type which gives the least colour. Claim has been made that the acetals give scarcely any yellowing; exceptionally the pentaerythritol acetals give some yellowing. By contrast most of the urea- and melamine-formaldehyde resins give greater yellowing.

(4) Most resin finishes lead to a reduction of fabric resistance to abrasion and it is generally considered that this adverse change results from a stiffening or embrittlement of the fibres due to the resin formed within them; the higher the amount of resin the greater the embrittlement and the lower is the resistance to ordinary everyday wear and tear. It would seem that cotton and rayon materials finished with an acetal to secure crease resistance and unshrinkability largely retain their original wear values and that, whereas the abrasion resistance of a fabric finished with say a urea-formaldehyde resin might be termed poor, that of the corresponding fabric finished with an acetal of the glycol acetal type would be termed excellent.

(5) It is generally necessary to wash-off a fabric finished with a urea-formaldehyde or similar resin with the object of removing externally adhering resin, since this confers undesirable stiffening of the fabric and in any case such resin would gradually leave the fabric during subsequent repeated laundering with a consequent change in fabric handle. Fabrics finished with acetals need not be so washed thus allowing economy of processing.

(6) It would appear that the loss of tensile strength produced by finishing with an acetal can be appreciably less than when urea-formaldehyde resins are employed.

(7) A significant difference is to be observed between the final water absorbencies of cotton fabrics finished with acetals and urea-formaldehyde resins as also with dimethylol ethylene urea. The former type of finish leaves the fabric with just about its original capacity for absorbing water during wetting (say 192% after as against 198% before finishing) whereas with the same fabric otherwise resin-finished it is usual for its water absorbency to be decidedly lowered.

Irvine and Kress provided the data summarised in Table 2 which allows a reasonable assessment of the usefulness of acetals of the modified glycol type in comparison with urea-formaldehyde resins for producing cotton fabrics

Table 2

Cotton Fabric Characteristic	After Finishing With: Modified Glycol Acetal	Urea-formaldehyde Resin
Crease Resistance	Medium (crease angle 220 to 235°)	Medium high (crease angle 240 to 260°)
	(crease angle of original fabric 150°)	
Chlorine retention:		
Immediately after finishing	None	High
Immediately after finishing and subsequent repeated laundering	None	High
Tensile strength loss	Very low (0 to 15%)	Medium (15 to 25%)
Durability of finish	Almost permanent	Moderately permanent
Handle (pure finish)	Full and crisp	Full and bouncy
Odour	Mild formaldehyde	Strong formaldehyde
Retention of abrasion resistance	Excellent	Bad
Water absorbency	No change	Decreased
Effect on whites	None	Slight yellowing
Suitable catalysts in finishing process	$MgCl_2 . 6H_2O$	$MgCl_2 . 6H_2O$ zinc nitrate Amine hydrochloride
Afterwash	Optional	Generally recommended

with a commercially acceptable enhanced degree of crease resistance.

It is to be noted that the data in Table 2 applies to cotton fabric finished with the modified glycol type of acetal, e.g., that mentioned above and which is prepared from diethylene glycol and formaldehyde. The pentaerythritol type of acetal tends to give a much higher crease resistance (say a crease angle of 250 to 300°) with a soft lively handle and of excellent durability but with a higher strength loss. However, this type of finish has not yet been fully developed and might therefore be expected yet to be improved upon.

Large Scale Processing

In a recent publication Irvine, Cronin and Davids (J. Text. Research; 1959, **29**, 74) gave further details of acetal finishing in the light of large scale processing carried out during the past year and with the use of a new modified glycol acetal now available as Quaker reactant 53 and which is a recommended alternative to the earlier Quaker reactant 16. A significant difference between the two is that whereas the latter could be especially recommended for producing a useful degree of crease resistance under mild curing conditions, such that the strength loss was exceptionally small, the new product gives a much higher crease resistance at the expense of a higher strength loss. However with Quaker reactant 53 it remains possible to secure under mild curing conditions a high crease resistance combined with non-chlorine retentivity and high durability of finish.

The following details concerning the finishing of a cotton muslin sheeting fabric with Quaker reactant 53 illustrates how it can be applied and the results to be expected.

The finishing liquor was prepared with—

12·0% of Quaker reactant 53
4·5% of magnesium chloride crystals
2·0% of a non-ionic polyethylene glycol softener
0·1% of a wetting agent

The muslin fabric was padded to show a 70% liquor pick-up, then dried on heated cylinders, cured for 70 secs. (a very short curing period compared with that involved with most resin finishes) at 310 to 320°F., and then washed, softened, and calendered. The essential characteristics of the finished and original muslin fabrics are set out in Table 3.

An interesting observation was made in applying an acetal crease-resist finish to cotton fabric dyed with Cibacron reactive dyes under circumstances where comparison could be made with the light fastness of the coloured fabric relative to that of similar fabric finished with dimethylol ethylene urea. It was found that the fabric finished with dimethylol ethylene urea faded noticeably within 10 hours, whereas the untreated fabric and also that finished with Quaker reactant 53 were equally but scarcely affected during the first 20 hours and only showed a slight fading at the end of 40 hours.

New Catalyst

Recently a new catalyst—alternative to the magnesium chloride found so generally useful—has been discovered which allows acetal finishes to be cured at lower than usual temperatures or at higher rates using higher temperatures. A cure at 250°F. for 1 min. using the new catalyst appears to be equally satisfactory to one at 315°F. using the magnesium chloride catalyst. Since higher curing temperatures promote more rapid impoverishment of the fabric being treated it is considered well worth developing this new catalyst for this reason, apart from the economies of processing it promises to allow.

From all that has been stated above the new acetal finishing agents appear to be very useful for securing improved crease- and shrink-resistant properties in cellulose fibre materials and for the production of wash-and-wear fabrics and garments. It must not be concluded, however, that these acetals will displace all other comparable finishing agents but it is to be expected that they will be preferred in all instances where it is essential that the finished fabric must be insensitive to hypochlorite treatments. Although the glycol and modified glycol acetals are most favoured at present it will be interesting to follow the progress made in developing the pentaertythritol acetals since these appear capable of producing a high degree of crease resistance yet free from chlorine retentivity. Today, pentaerythritol is a readily available polyhydric alcohol and the manufacturers are only too anxious to further its use in the textile industry.

A feature of present day methods for finishing cellulose fibre materials with resins and other reactants for securing crease- and shrink-resistance is the progress being made in combining these finishing agents to obtain in the one finish all the possible advantages. Thus since the discovery that epoxy

Table 3

Fabric Characteristic	Original Fabric	Finished Fabric
Tensile strength (lbs.)	74 × 65 (warp) (weft)	44 × 43 (warp) (weft)
Tear strength (Elmendorf)	1·6 × 1·3	1·4 × 1·1
Crease angle after 0 washes	171°	240°
5 washes	—	230°
% Chlorine damage after 1 wash	1	0
5 washes	6	0
Wash-wear rating	Poor	Reasonable

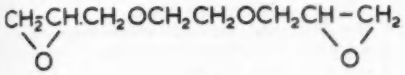


Fig. 13

compounds could be used for enhancing the resistance of cotton and rayon fabrics to creasing and shrinkage several new techniques have been developed in which epoxy and urea resins can be applied together. The epoxy compounds whose special chemical structure is typified by that of glycol diglycidyl ether as shown in Fig. 13 have the power to combine with cellulose molecules and also cross-link them as shown in Fig. 14.

A characteristic of cellulose fibre materials treated with these epoxy compounds is the high degree of permanence of the finish and their non-retentivity of chlorine. Thus for the production of white crease- and shrink-resistant cotton and rayon goods it would seem desirable to devise finishing procedures based on combinations of acetals and expoxy compounds. This aspect of finishing is now being investigated and useful results can safely be predicted for the near future.

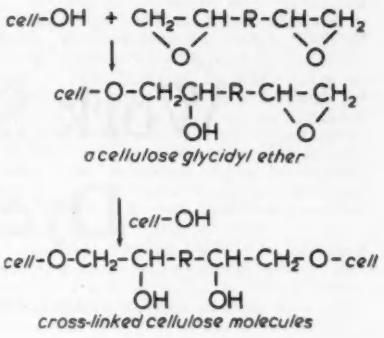


Fig. 14

New Laboratories of Clayton Aniline

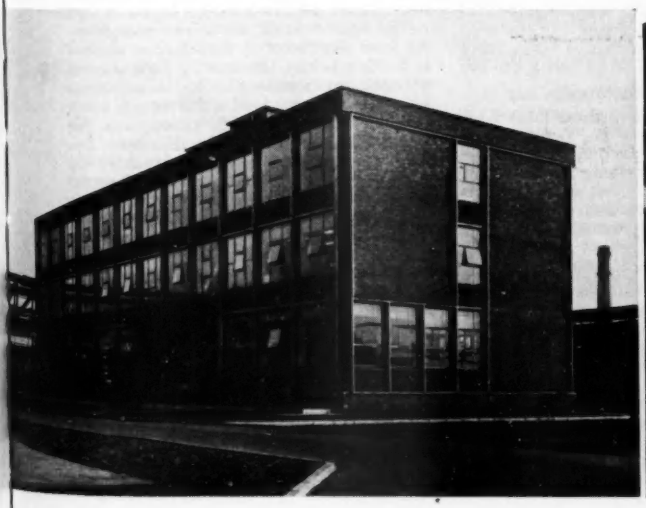
DR. R. KAPPELI (chairman, Ciba Ltd., Basle: recently officially opened a new building, comprising a dyehouse for quality control and research laboratories, part of a scheme to modernise the plant of Clayton Aniline Co. Ltd., of which Ciba is the principal shareholder in conjunction with J. R. Geigy S.A. and Sandoz Ltd.

The dyehouse occupies the whole ground floor in this new air conditioned building of modern design and construction. New research laboratories take up the first floor, the second floor being available for further laboratory extension. One of the many features of the dyehouse is the pneumatic system for delivery of samples from the factory and despatch of reports. After receipt of samples from the vacuum tubes there is a preliminary evaluation by recording spectrophotometer, the use of which considerably reduces testing time. The whole concept is one of the modern "flow" principle whereby the samples are put through various tests, ensuring perfect standardisation. There is the standard range of machines and equipment for inspection of dyeings to ensure they are up to standard in all respects.

Ciba Ltd., Basle, this year celebrates its 75th anniversary, and now has 42 subsidiaries in a world-wide organisation. Dyestuffs and pharmaceuticals remain two of Ciba's main activities but the organisation extends to many other fields, notably plastics. One of the oldest firms affiliated to Ciba is Clayton Aniline, now in its 84th year.

At the opening ceremony, Sir Arthur Vere Harvey, M.P. for Macclesfield, and chairman of the Ciba organisation in Britain, said the opening of the new dyehouse represented the first stage in a modernisation programme at Clayton Aniline. There were difficulties ahead of us, he said, and with the possibility of a European Free Trade Area we had to be modern and compete in a price market. Labour relations at Clayton had never been better. If management and workers continued to pull together as a team, he looked forward to the future with great confidence.

New laboratories, including the dyehouse, for quality control of manufactures



A section of the general dyeing laboratory

Leek Textile Society

Work Study in a Dyehouse*

By J. N. PADDISON, A.M.W.S.S., A.M.B.I.M.†

WORK study, the enemy of Parkinson's law, can be applied to almost every form of human activity and show worthwhile results. Because it is concerned with bringing about change, it is very much pre-occupied with human relations problems both of groups of people and individuals. As its name implies, it is more of a mental discipline, a way of looking at work, than a body of technology.

In post-war years, the commission dyehouse has been forced to accept many changes. There has been a surge of new fibres, and a remarkable complexity of mixtures old and new. Coupled with this, have been the development of new types of dyeing machinery, new dyestuffs, and the changed industrial atmosphere brought about by over-full employment. Because of this, the commission dyehouse has become a highly flexible multi-product plant concerned with a variety of processes and dyeing a constantly changing range of small batch lots.

Machine cycle time will vary widely for different processes, and because the incidence and size of a particular product varies, it is clear that the pattern of work is likely to show considerable day-to-day variation. Moreover, it will be predictable only on a short-term basis. An additional problem is that it is still not possible to state that two lots of the same material, given exactly the same dyeing treatment, will always match for shade.

Before tackling an assignment, we spend much time in joint consultation. The first thing to do is explain to the dyehouse manager, the foreman dyer, shop steward, and dyehouse representatives what has to be done. This is important and must never be omitted. Success in work study application cannot be achieved unless there is a promise of co-operation before the start.

Good management will, of course, always ensure that the operations which are carried out should be laid down clearly in detail and in a multi-product plant it is essential. The task of doing this for the first time is usually arduous, and not infrequently the foreman dyer has to consult the man on the shop floor to find out how a certain job is done.

A random observation study is then carried out and is a useful and simple statistical technique. Its simplest form consists of a series of random visits by an observer to the dyehouse, who notes whether or not a machine or man is working. To take an example, suppose 200 observations of a machine were taken over a period of 8 hours and the results were as follows:—

Machine working 160 observations
Machine not working 40 observations
Then machine working =

$$\frac{160}{200} \times 100 = 80\% = 6{\cdot}4 \text{ hrs. out of } 8$$

Machine not working =

$$\frac{40}{200} \times 100 = 20\% = 1{\cdot}6 \text{ hrs. out of } 8$$

The use of this technique for a few days will give a reasonably accurate picture of both machine and labour utilisation. An examination of these results, together with observations in the dyehouse should enable one to decide if a full work study investigation will be worthwhile. If it is, full, detailed studies are taken in the dyehouse covering all activities. Careful attention must be paid to machine cycle times and all manual operations.

Normal time study technique is used, i.e., recording actual times, and an assessment of the effective speed of an operator by use of a rating factor. This part of an investigation can take as long as 4 or 5 weeks, but it must be carried out as accurately as possible.

Analysis

The next stage is to sort out the results obtained by analysis and tabulation. This analysis and criticism of present methods is perhaps the most important step in a work study investigation. These are the questions we ask:—

(1) What is achieved? Why is it necessary?
(2) Where is it done? Why there?
(3) When is it done? Why then?
(4) By whom is it done? Why that person?
(5) Why is it done that way?

Getting the answers to these takes a lot of time and demands an awful lot of patience from everyone. We find it an advantage to have a working knowledge of dyehouse "know how" but not to be too well versed in the arts and intricacies of dyeing. It means that we ask all sorts of awkward questions.

Every dyehouse falls into habits that are liable to become traditions and to be preserved long after the circumstances that justified them have passed. In this situation the inquiring mind is a disturbing and sometimes unwelcome intrusion. As a case in point, in one factory the idea of rotating managers between departments had been adopted and one manager had been transferred to a dye house. Unfortunately, he knew nothing about dyeing so went right ahead trying to do those things that could not be done. Incidentally, we do not rotate our managers.

We often find there are three ways of doing a job: (*a*) as the foreman dyer thinks it is being done, (*b*) as it is done by the operative when under observation and (*c*) as the operative usually does it. *It is an interesting fact that the third method is not infrequently the best and quickest way of doing the job.*

Sometimes we find that answers to many questions are so unsatisfactory that it is obvious dyeing methods should be revised by an expert laboratory technician. Dyers seem passionately fond of rinses and we find often they absorb a lot of machine time. It is not uncommon to find that machines of 1,000 galls. are fitted with the same 2 ins. inlet pipe as the 250-gall. machine, and the same often applies to the size of the outlet pipe. Consequently, although only a 5 mins. rinse is required, it may take 20 mins. to fill a machine and 15 mins. to drain it; 40 mins. machine time for a 5 mins. process.

Eventually, however, methods and processes are finalised, and we can get on with the job of building the standard times into work values for sections or stages of each process. Accurate machine cycle times are also drawn up at this stage.

Many of these elemental times are common to several processes, and as a mass of measurements have been built up, it is possible to produce work values by synthesis. The use of such values for synthesis must be used with discretion because of the individual characteristics of certain processes.

It should also be remembered that although workers are often suspicious of times derived by the stop-watch they are more suspicious of work values issued from an office without a stop-watch being seen.

A simple example of the type and form of the standards produced can be illustrated in hydro-extracting (Table 1).

Table 1. Hydro-Extracting (Average load 50 lbs. yarn)

Operation	Outside Work in SMS	Inside Work in SMS	Machine Running Time
Load hydro ..	5·0	—	—
Start hydro and check balance	—	1·0	—
Hydro	—	—	9·0
Brake	—	0·5	—
Unload hydro	3·0	—	—
Remove goods to stove ..	—	0·5	—
Totals ..	8·0	2·0	9·0

The operation of taking the yarn from the hydro-extractor to the stove is classed as inside work as this can be done during the time the next load is in the machine. The cycle time per load is the outside work calculated at an 80 performance plus the machine running time. In this case, the cycle time is 8·0 mins. outside work which at an 80P becomes 6 mins. plus 9 mins. machine running time—a total of 15 mins.

So far as the machine operator is concerned, if he is only given one hydro to operate his work load can be simply calculated by adding together the outside work and the inside work—8 SMS plus 2 SMS = 10 SMS per load, or 40 SMS per hour. Clearly, he can be given two machines to operate, and his work load will become 80 SMS per hour, and full machine efficiency will also be attained.

Such perfect balance is rarely achieved, and one is usually faced with the choice of obtaining high machine efficiency or high labour efficiency. This choice is governed by many factors, one of the most

* *From a paper given recently to Leek Textile Society.*

† *Stevensons (Dyers) Ltd., Ambergate.*

Table 2. Dyehouse Employing 5 Men on 10 Machines

	£	£	
Labour costs: 5 men × 9½ hours × 246 days at 5s. per hour			2,921 p.a.
Machine utilisation 70% Machine hours worked = 10 m/cs. × 9½ hours/day × 70% util. × 246 days			16359 hrs.
Level of output = 25 lbs. per machine hour			408975 lbs.
Cost of direct labour			1·71d. per lb.
Overhead expenses—			
(A) Fixed expenses			
Supervision		1200	
Depreciation—			
P+M. 10% on £20,000		2000	
L+B. 2% on £25,000		500	
Rates and building repairs		250	
Colour storeman		600	
Planning office		750	
		5300	3·11d. per lb.
(B) Semi-variable expenses			
Steam (incl. fixed cost of boilers)		2000	
Water (incl. fixed cost of water plant)		1000	
Repairs and renewals (incl. fixed cost of mech. shop)		1000	
		4000	2·35d. per lb
(C) Variable expenses			
Electricity		250	
National insurance (9 men × 8s. 3d. × 52 weeks)		193	
Holiday pay (6 men at £28 7s 0d p.a.)		170	
		613	0·36d. per lb.
Total department labour and overhead cost			7·53d. per lb.

Table 3. Dyehouse Employing 8 Men on 10 Machines

	£	£	
Labour costs: 8 men × 9½ hours × 246 days at 5s. per hour			4674
Machine utilisation 95% Machine hours worked = 10 m/cs. × 9½ hours × 95% util. × 246 days			22201 hrs.
Level of output = 25 lbs. per machine hour			555025 lbs.
Cost of direct labour			2·02d. per lb.
Overhead expenses—			
(A) Fixed expenses			
Supervision		1200	
Depreciation—			
P+M. 10% on £20,000		2000	
L+B. 2% on £25,000		500	
Rate and building repairs		250	
Colour storeman		600	
Planning office		750	
		5300	2·29d. per lb.
(B) Semi-variable expenses			
Steam		2400	
Water		1200	
Repairs and renewals		1300	
		4900	2.12d. per lb.
(C) Variable expenses			
Electricity		339	
National insurance (12 men × 8s. 3d. × 52 weeks)		257	
Holiday pay (9 men at £28 7s. 0d. p.a.)		255	
		851	0.37d. per lb.
Total department labour and overhead rate			6.80d. per lb.

important considerations being a comparison of machine hour rates and labour hour rates. Examples of some of these considerations are given in Tables 2 and 3.

It will be noted in the examples that machine efficiency has been increased by 25% (i.e. from 70% to 95%) but direct labour cost per lb. produced has increased from 1·71d. per lb. to 2·02d. per lb. Fixed overhead expenses per lb. have obviously decreased, due to the greater volume of production, and semi-variable expenses show a small decrease. Variable overhead expenses increase slightly, due to the cost of employing the additional three men and the increased consumption of electricity. The total effect, however, of increasing machine utilisation is to reduce departmental labour and overhead costs from 7·53d./lb. to 6·80d./lb.—a saving of 0·73d./lb. or 9·7%.

These examples are in line with normal experience, but I must point out that the figures set out are for illustration and do not attempt to represent fact. Many other factors have to be considered, such as availability of capital, land for further extensions, building time, and delivery dates for new machines, and the demand for an expansion of capacity.

Calculations similar to the simple one in Table 1 for hydro-extractors are then made for all the many types of processes and machines found in a commission dyehouse. Machine cycle times are kept to the minimum by ensuring sufficient labour is available to service the machines at the proper time—i.e., making sure a machine is never waiting for attention.

Dyehouse operatives are therefore restricted in the amount of work they can do and a device known as NWT (normal working time) is used to simplify the problem. NWT is a term used to define the proportion of time for which an operator is employed and is usually expressed as a decimal. On unrestricted work the operator is 100% employed and his NWT is 1·0.

Consider again the man operating a hydro-extractor. If he has only one machine to control, he has only 40 mins. work per hour, when working at a conscientious day-rate speed. If he was working under incentive conditions, we could assume he would work 33% faster. In such circumstances, he would work 30 mins. per hour, or 30 secs. every minute, and his NWT would be 0·5.

Process Allowance

In order to keep labour costs to the minimum, NWT calculations are made for all operatives, the aim being to increase each operative's NWT to unity whenever possible provided this will not result in an extension of machine cycle times. A further device, known as PA (process allowance) is then used. When calculating NWT it was assumed the operators would work at an 80 performance and that the balance of the time would be idle. Process allowance is, in fact, a device to ensure that an operator who works conscientiously on restricted work, i.e. where his NWT is less than unity, will be able to earn a just bonus. Thus he is credited with his idle time at day-work rate or 60 performance.

In the example on the hydro-extractor, if there was only one hydro and it was impossible to give the man any more work to do, his NWT was ·5 or 30 secs., when working at an 80 performance. Thus every minute he will be credited with 40 + 30 secs., and will therefore produce a pay performance of 70 SMS/hour. If he is paid on a straight proportional basis, he would receive 16⅓% bonus for doing in effect, half a day's work per day.

Clearly in such circumstances, there is no obvious benefit to management in applying an incentive except that the operators are probably demanding it. One of the disadvantages of the use of PA is that if by technical development or other means it is possible to increase the NWT of an operator, the increase in the operator's bonus earnings is small in comparison to the increased effort required.

For example, assume that work load which limits NWT to 0·5 is increased to 0·75. We have seen that with a NWT of 0·5 an operator would receive 16⅓% bonus, but at 75% occupied he will receive an increased bonus of only 8¼% although the amount of work he has to do has increased by 50%. Thus the PA procedure introduces a number of difficulties, but if work values and incentives are to be applied strictly on the basis of labour utilisation it is probably the most satisfactory method of dealing with restricted work.

But the fact that NWT is less than unity proves that maximum labour utilisation is not the policy of the company. The function of the operatives is to maintain maximum output from the machines with optimum quality and minimum waste. Physical effort may be very secondary in relation to alertness and attention. In these circumstances, the conventional approach of basing bonus payments on the actual work done may not be the most suitable.

Where the policy of the company is to obtain a high level of machine utilisation and efficiency an incentive can be based on this factor. Using the PA calculations to assess work load, a bonus scale could be drawn up, which might take the following form:—

Machine utilisation %	Bonus %
100	45
90	30
80	15
70	nil

This procedure would give the operator an incentive to obtain the highest machine utilisation and he would recognise that his bonus is not, in fact, directly related to physical effort.

However, the type of bonus payment scheme eventually adopted must depend on the particular circumstances which obtain in the dyehouse. Whatever scheme is finally adopted, must carry the full confidence of top management. The problems in introducing a new scheme are many, being mainly concerned with that unknown factor—human beings, and it may be that top management help will be required when introducing the scheme.

Careful explanations must be given to supervisors as to what the new plans are and why they have been developed, and also what special attention will be required from supervisors if the plans are to succeed. Full details of the plans must then be given to the operators concerned and their representatives. The single step which will help most to get the scheme going is a display by the work study engineer of real interest in the effect of the changes on every operator.

The results of a work study application can be extremely valuable in many other ways. For example, the information made available can be used for the benefit of management in a number of ways:—

(1) Production planning.
(2) Costing.
(3) Control of the use of labour.
(4) Control of the use of machines.
(5) Cost control.

The greatest importance of work study is in the way it can assist management to do its job effectively. Good factory management consists of using skill, training and effort of operators, machines and equipment, materials and factory space to the full advantage of the owners of the business, the workers and the customer.

Recent Developments in Wool Textile Finishing*

Setting, a well-established process in wool finishing, has taken on increased significance with the growing production of synthetics

By C. S. WHEWELL, PH.D., F.R.I.C., F.T.I.†

WOOL cloths are set by several methods including crabbing, wet blowing, dry blowing and pressure steaming. Each method has its own merits but in all cases accurate control is essential if the best results are to be obtained. The effectiveness of any setting treatment is dependent on the medium in which the process is carried out. In buffered solutions the optimum pH for setting is about pH 8·4.

Two of the disadvantages of crabbing and other wet treatments is the possibility of colour bleeding and lustring. These defects can be avoided by dry blowing. Again pH control is essential and so is the time of treatment, and unless the time of blowing exceeds 5 mins. the degree of permanent set induced is generally not adequate. The effectiveness of this process can be greatly increased by impregnating the cloth with reagents such as bisulphites or alkalis which have been shown to facilitate permanent setting. Dry blowing has increased in significance with the development of blended fabrics and many of these materials are adequately set by this means.

Permanent Pleating

The excellent pleating and pleat retention properties of many fabrics containing appreciable amounts of thermoplastic fibres such as "Terylene," "Tricel" (cellulose triacetate) and acrylics, have established new standards of acceptance for fabrics to be used in the manufacture of ladies' skirts, etc. Even in men's wear the ability of a fabric to take a permanent crease is important. Wool/"Terylene" fabrics have been particularly successful in this field and have established a standard which must now be met by other fabrics. Wool/"Tricel" blended cloths containing some 65% of "Tricel" are readily pleated and hold their pleats well, but care must be taken during finishing to avoid setting these cloths so that they become subsequently difficult to crease or pleat. This observation illustrates an important aspect of modern finishing, viz., that the end use of the fabric must always be considered when deciding upon a finishing routine. It was to be expected that the good reception of these wool/man-made fibre blended fabrics would stimulate the production of 100% wool fabrics which could be permanently pleated.

Two processes for producing permanent pleats in wool fabrics have been publicised. The "Si-Ro-Set" process involves spraying the cloth with a solution of ammonium thioglycollate at pH 7 and then pressing or pleating in the usual way. The results obtained are good, but it is advisable to test the fastness of dyed material to this treatment before processing large amounts as some dyes, particularly acid dyes, are not fast. In an alternative patented process (B.P. 775,486), the reagent is incorporated in the cloth by the finisher. The process consists essentially in impregnating the fabric with sodium bisulphite solution as the last wet process in the finishing routine. Clearly this procedure has many advantages over the previous one. The fastness of dyes must also be examined but due to the acid conditions under which the process is carried out most dyes would probably withstand the treatment. Both the above-mentioned processes yield good results. It may be that superior processes will emerge when more is known about the precise mechanism of permanently setting wool, but the development of the above methods into commercial processes emphasises that wool can be creased and pleated and that the effect can be made permanent.

Scouring

The basis of good dyeing is good scouring. Present day scouring practice varies widely from one mill to another, all methods apparently yielding cloth which meets with customers' demands. The variations are no doubt due to attempts to obtain a specific handle. Most of these methods have been found satisfactory for cleaning all-wool fabrics but difficulties have been met with when the same methods are applied to some blended fabrics, e.g., wool/"Terylene" blends. There is no doubt that olive oil, for example, is more difficult to remove from "Terylene" than from wool. To ensure adequate cleaning of certain 50/50 wool/"Terylene" cloths a more efficient detergent system than that normally used is necessary, or a polar compound should be incorporated in the oil to reduce its adhesion to the fibre. There is no doubt that the adhesion between a fibre and an oil is specific and this must be taken into account when deciding upon scouring routines. It is, therefore, unwise to assume that the same generalisations hold for all fibres.

Most wool type cloths shrink during scouring, the extent depending upon the construction of the cloth and the severity of the scour. In general, blended cloths shrink by the same amount as the corresponding all-wool fabric or shrink rather less. The corresponding fabrics made from 100% rayon or synthetic fibre shrink less than the all-wool cloth, except in the case of fibres such as "Fibrolane BX."

Milling and Felting

Although wool felting has received considerable attention, the process is still incompletely understood. Of particular interest is the role of soap in the process. Certainly it functions as a lubricant, for fabric extracted with ether and alcohol mills less readily in acid than soap-scoured material which presumably still contains a little soap. Other materials can also function as lubricants and small amounts of liquid paraffin applied to commercially soap-scoured cloth accelerate the rate of shrinkage. Soap also minimises flocking and facilitates the production of cover, and it is probably for these reasons that it continues to be widely used as a milling agent. The type of soap employed affects both rate of shrinkage and the handle and appearance of the finished cloth, and it would appear that a medium-low titre soap yields the best results. Synthetic detergents as milling agents often yield a lean and thin cloth but a mixture of 2 parts synthetic detergent and 1 part soap gives good results even though the treatment is carried out at pH values near neutrality. Cationic soaps also facilitate milling and yield very soft cloths. Some of these cationic soaps (e.g., "Cetavalon") are also very efficient anti-bacterial agents.

Chemical Processes

(1) *Bleaching*.—White wool is usually bleached with sulphur dioxide or hydrogen peroxide. Hydrogen peroxide is normally applied from solutions made alkaline by the addition of sodium silicate or Stabiliser C (Laporte). Recently a new process has been developed in which the peroxide is used at pH 3 - 4 by adding Stabiliser MP (Laporte). Pigmented wools are not bleached by the usual peroxide processes and it is necessary either to increase the alkalinity of the solution or to add iron salts as catalysts. Both processes can cause damage and the use of formaldehyde as a cross linking agent is advocated.

A new controlled process has been devised as a result of studies on the properties of the pigment granules in wool. It was found that the pigmented wools take up more iron than white wool and also that the iron is more firmly held. The bleaching process consists in immersing the wool in ferrous ammonium sulphate solution, rinsing thoroughly to remove excess and loosely bound iron and then treating with peroxide solution at pH 6. The handle of all peroxide bleached materials is improved by after-treatment with softeners such as Fixanol C or Sapamine KW.

(2) *Processes to Render Wool Fabrics Non-felting*.—Wool felts because of fibre movement during washing or wear which causes the material to become a consolidated mass. Non-felting materials are produced by:—

(1) Reducing the scaliness or D.F.E. of the wool fibres.
(2) Making the wool fibres more difficult to extend or to impair their power of recovery.
(3) Preventing fibre movement by "spot welding."

Most commercial processes depend primarily on 1, but some are assisted by 3.

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* *From a paper given recently to the Guild of Technical Dyers in Batley and Huddersfield.*

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Chlorine is the oldest reagent used to make wool non-felting. The scales and the layer immediately underneath the scales are attacked, rendering the scales inoperative in the wash liquors. Early methods used a mixture of sodium hypochlorite and sulphuric acid, but the results tended to become uneven. More recently the importance of pH control in this process has been realised. If the pH is maintained at pH 3 - 4, mainly hypochlorous acid is produced and this reacts less vigorously with the wool. Mixtures of sodium hypochlorite and formic acid at pH values of 3 - 4 are used in the "Negafel" process. The reaction can also be controlled at pH 8 when the active agent is the hypochlorite ion, but it is necessary to increase the activity by means of potassium permanganate. In the "Dylan" process, the reagents used are sodium hypochlorite and potassium permanganate, and the excess reagent is removed by sodium bisulphite.

An alternative chlorination process is the "Melafix" process. The bath is prepared by adding to water the appropriate amount of hydrochloric acid (7 - 8%) and 2% "Melafix" (Ciba) and a wetting agent. The goods to be treated are then run in the liquor for 5 - 10 minutes when a dilute solution of sodium hypochlorite (equivalent to 1·5 - 2% of available chlorine on the weight of the goods) is added over a period of 45 minutes. The pH of the liquor should not exceed 3 - 4 and chlorination should be carried out over a period of 1½ hrs. About 3% of sodium bisulphite (40% solution) is then added to the liquor as a dechlorinating agent. To soften the fabrics 0·5 - 1% Sapamine WL solution applied from a slightly acid bath at 30 - 40°C. is recommended.

It has been recognised that if possible, the reaction of the chlorine should be kept to the surface of the fibres, and this can be achieved by using chlorine gas as in the W.I.R.A. process and by using a solution of chlorine in carbon tetrachloride. Following the recognition that many reagents which yielded non-felting effects were also capable of breaking the -S-S- bonds in the wool, many new processes were developed. Some of the more important reagents were:—

(1) Caustic soda. This is applied from solution in either industrial alcohol (C.S.I.R.O. process) or in a mixture of white spirit and butyl alcohol ("Tootal" process). In both these processes solvent recovery is important. In the C.S.I.R.O. process the use of low (1 : 1) goods: liquor ratios are advocated and carbon dioxide is used to neutralise residual alkali.
(2) Sulphuryl chloride in white spirit (Drisol process).
(3) Hydrogen peroxide in presence of metal catalysts.
(4) Enzymes, e.g., papain activated with sodium bisulphite on untreated or dry chlorinated wool.
(5) Peracetic acid, e.g. (i) treatment with peracetic acid followed by standard W.I.R.A. papain process, (ii) mixtures of peracetic acid and sodium hypochlorite.
(6) Permonosulphuric acid followed by sodium bisulphite.

The scaliness of wool fibres can also be altered by depositing polymers on the fibre surface. The first reagent to be used for this purpose was anhydrocarboxyglycine and fabrics of good resistance to shrinkage and improved resistance to wear were obtained. The reagent is, however, expensive and consequently melamine-formaldehyde resins have been used for a similar purpose. The fabric is padded with the components of the resin, dried and baked. Alternatively, nylon or a derivative of nylon may be deposited on the surface. The reagent used is the product of the reaction between formaldehyde and nylon, and is applied from solution in 95% alchohol. After the cloth has been impregnated it is treated with hydrochloric acid and the nylon or a derivative ($N\text{-}CH_2\text{-}N$) precipitated on the fibres. Gelatine/formaldehyde coatings can be applied for the same purpose. In many cases the dye affinity of the sample is altered but it is important to note that the change is very dependent on the conditions under which the process is carried out; e.g., treatments with hypochlorite solutions at pH 3 increase the dye "affinity" while those at pH 9 decrease the dye affinity. At an intermediate pH, which varies according to the dye being considered, the treated material responds to the dye in the same way as the untreated.

Modification of Dye Affinity

Most processes for modifying the dye affinity of wool and nylon are only in the laboratory stage but novel effects can be obtained by constructing fabrics containing untreated and chemically treated fibres. The reagents which have been studied most extensively include: acetic anhydride in presence of acetic acid, sulphuric acid and pyridine; glyoxal sodium bisulphite, alkaline solutions of hypochlorites; tannic acid; and synthetic polymers such as polyacrylic acid. The "Maifoss" process is, however, being applied commercially. In a single bath dyeing of an all-wool blend some fibres are more heavily coloured than others or different colours go on to different fibres, thereby yielding a Lovat or melange effect. In this process the difference is exaggerated by the selection of dyes and the addition of synthetic tanning agents which are adsorbed unevenly and produce an unlevel resist.

In an investigation of methods for modifying the amino groups of wool, it was found that bromacetates could be used to produce interesting resist effects. Several reactions are possible, viz.:—

$$R\text{-}NH_2 + CH_2Br.COOH \rightarrow RNH.CH_2COOH + HBr$$

$$R\text{-}NH_2 + 2CH_2Br.COOH \rightarrow RN(CH_2COOH)_2 + 2HBr$$

$$R\text{-}C_6H_4\text{-}OH + CH_2Br.COOH \rightarrow R\text{-}C_6H_4\text{-}O\text{-}CH_2COOH + HBr$$

The optimum conditions for obtaining a resist seem to be to treat the wool in a 5% solution of bromacetic acid in presence of an excess of magnesium oxide at 60°C. for 1 hour. The effect produced depends on the basicity of the acid dye used, the polysulphonated dyes Naphthalene Scarlet 4R (I.C.I.) and Lissamine Green SF (I.C.I.) revealing the most marked contrasts.

It is well known that sulphuric acid reacts with wool. Reactions involving optimum effect is obtained by using a 5% solution of bromacetic acid in the presence of an excess of magnesium oxide at 100°C. for 2 hours. The trisulphonated dyes such as Lissamine Green SF produced the most marked contrast. Local application using a 10% solution of bromacetic acid along with an excess of magnesium oxide followed by steaming for 15 mins. produces a good resist.

amino groups or tyrosine residues have been postulated. The conditions of treatment which have been examined are, however, those related to carbonising, and the concentrations of acid considered, do not usually exceed say 20%. Recent experiments have shown that extremely interesting results can be obtained simply by padding the cloth with concentrated sulphuric acid and then immediately neutralising the acid to prevent excessive degradation. Provided the time of treatment does not exceed 30 secs. degradation is not severe. Fabrics treated in this way show a complete resistance to dyeing with Solway Blue under conditions where an untreated fabric would be dyed deep blue. The process is made possible largely because wool cloth is rapidly wetted by concentrated sulphuric acid and because the chemical reaction between the wool and the acid must also be rapid. If the concentration of the acid is reduced even to 90%, wetting becomes markedly more difficult and level results are not obtained. The treated fabrics are also shrink resistant, in that they shrink by only 3% when hand milled along with a sample of untreated material until this control sample shrinks 30%. The effectiveness of the non-shrink effect also falls rapidly as the concentration of the acid falls.

T.H.P.C. (tetrakishydroxymethyl phosphonium chloride) also modifies the dyeing characteristics of wool. This reagent is normally used to produce fire resistant cellulose but it was found that it reacted with wool and that when a sample of the treated fabric was dyed along with one of untreated wool, the treated material adsorbed very much more dye than the control. This would suggest that the T.H.P.C. is attached to the wool in such a way that a large number of positively charged sites are introduced.

The bromacetate treatment, described previously, markedly reduces the uptake of dye by nylon, "Perlon" and silk when using acid, premetallised and chrome dyes, and dyeing equal weights of treated and untreated material in the same bath.

It is again important to ensure the presence of an excess of magnesium oxide, i.e. the pH of the reaction mixture is about pH 9·2 during the reaction. No doubt the action is one of carboxymethylation and the

Export Opportunities

Rhodesia and Nyasaland:
Dress and Furnishing Fabrics

E. W. Dunckley and Son (Pty.) Ltd., P.O. Box 1239, Bulawayo, Southern Rhodesia, would like to represent U.K. manufacturers of dress and furnishing fabrics, on a commission basis.

They are a well-established firm of manufacturers' representatives and full Federation-wide cover is given through regular and frequent travelling. Manufacturers interested should write direct, also notify the U.K. Trade Commissioner, R.T.A. House, Baker Avenue, Salisbury, Southern Rhodesia.

Germany:
Machine Knitting Woollen Yarns

Klaus and Hans Pade, 76 Potsdamer Str. Berlin W.35, have advised the British Consulate-General at Berlin that they would welcome an agency for a U.K. firm manufacturing machine knitting woollen yarns. The firm are wholesalers for wools, yarn and stockings. Manufacturers interested should write direct, also notify the British Consulate-General, Commercial Section, Charlottenburg 2, Uhlandstrasse 7-8, Berlin.

Union of South Africa:
Pram Sets

G. E. Pritchard, 51 Manchester House, Cor. Von Weilligh and Pritchard Streets, Johannesburg, are interested in obtaining U.K. agencies for babies' pram sets. Established in 1944, they represent two U.K. concerns for piece goods and lambswool knitwear, also German, Swiss and Dutch firms. Suppliers interested should write direct, also notify the U.K. Trade Commissioner, P.O. Box 10101, Johannesburg.

Vietnam:
Leather Cloth

Etablissements A. M. Frey, 18 Dai lo Nguyen Hue, Saigon, want to contact a U.K. supplier of textile-backed decorated leather cloth for women's handbags. The firm have offices in Vietnam and Cambodia and trade as importers and commission agents. Manufacturers interested should write direct, also notify the British Embassy, Commercial Department, Hongkong and Shanghai Banking Corporation Building, 1 rue Georges Guynemer, Saigon.

Germany:
Piece Goods, Blankets

Mr. C. Lorenz, 171 Kurfürstendamm, Berlin W15, would welcome information from U.K. manufacturers of poplin raincoat material, tweed piece goods, trouser and shirt materials, wool and cotton knitted material for underwear and first quality blankets. He represents about ten firms, including some U.K. cotton spinners, and manufacturers interested should write direct, also notify the British Consulate-General, Commercial Section, Charlottenburg 2, Uhlandstrasse 7-8, Berlin.

Chile:
Fishing Nets

J. H. Spencer y Cia. Ltda., Agustinas 785, Of. 460, Casilla 627, Santiago, wish to represent U.K. manufacturers of synthetic fibre fishing nets. Claiming to cover Chile, Peru, Colombia and Bolivia, they represent U.K. manufacturers of conveyor belting, baling material, etc. Manufacturers interested should write direct, also notify the British Embassy, Commercial Secretariat, Bandera 227, P.O. Box 72-D, Santiago.

U.S.A.:
Sewing Thread

British Quality Merchandise, 45 West 45th Street, New York 36, N.Y., would like quotations from U.K. manufacturers of 50/3 sewing thread made from Egyptian staple and wound on to $\frac{5}{8}$ in. dia. tubes ready for dyeing. The quantity would be 50,000 to 100,000-lb. lots. British Quality Merchandise are factory representatives for a number of U.K. manufacturers. Suppliers interested should write direct. Quotations should show both f.o.b. and c.i.f. U.S. port prices per lb. in U.S. dollars, and firms should copy correspondence to the British Consulate-General, 7th Floor, 99 Park Avenue, New York 16, N.Y.

Western Germany:
Shirting

The firm of Friedrich Bischoff, Hasengasse 15, Frankfurt-am-Main, wish to contact U.K. manufacturers of Oxford shirting material. Established in 1867, they are retailers dealing in cotton and linen textiles and fabrics, dress material, blankets, etc. Manufacturers interested should write direct, also notify the British Consulate-General, Commercial Section, 47 Zeppelin Allee, Frankfurt-am-Main.

Bahrain:
Blankets and Table Linen

Mr. K. H. Khiara, P.O. Box No. 384, Manama, Bahrain, would appreciate offers of blankets, bed and table linen. He is a commission agent and manufacturers interested should write direct, also notify the British Residency, Commercial Secretariat, Jufair, Bahrain.

Tunisa:
Flags and Bunting

The director of the Tunisa International Fair would like to get in touch with U.K. firms interested in supplying national flags and bunting for the Fair in October, 1959 (and possibly in subsequent fairs). Suppliers interested should write immediately to M. le President, Comite de la Foire de Tunis, Avenue Mohamed V, Tunis, also notify the Commercial Department, British Embassy, 5 Place de la Victoire, Tunis.

Fiji:
Dress Cloths and Household Textiles

M/s Central Stores (Suva Branch), G.P.O. Box No. 131, Suva, Fiji, would like to represent, on a commission basis, U.K. manufacturers of printed cotton and rayon dress fabrics, poplins, haircords, casements, sateens, cotton sheets and pillow-cases, drills, terry towelling, also piece-goods of all types. Firms interested should write direct giving full details and prices, c.i.f. in sterling including 5% commission.

Italy:
Woollen and Fancy Piece Goods

Messrs. Virgilio Gori, No. 2 Via dei Pecori, Florence, want to represent U.K. manufacturers of tweeds and woollens for men's suits; lightweight suitings; poplin shirtings and fancy poplins for women's wear. Manufacturers interested should write direct, also notify the British Consulate, Palazzo Castelbarco, 2 Lungarno Corsini, Florence.

Western Germany:
Woollen Yarns and Knitting Machines

Domitas-Grosshandels-Gesellschaft m.b.H., Frankfurt, Taunusanlage 21, want to contact U.K. firms supplying woollen yarns for all kinds of knitted fabrics and machines for knitting socks. Established in 1952, they work exclusively on commission. Suppliers interested should write direct, also notify the British Consulate-General, 47 Zeppelin Allee, Frankfurt.

Jamaica:
Towels, Table Cloths, etc.

H. M. Brandon and Co. Ltd., 44 Orange Street, Kingston, are interested in a U.K. agency for bed linents, towels, table cloths, napkins, etc., particularly for use in hotels. They are an old-established firm and already represent many well-known manufacturers of hotel equipment. Suppliers interested should write direct, also notify the U.K. Trade Commissioner, Barclays Bank Building (P.O. Box 393), Kingston, Jamaica.

Western Germany:
Waste, Felts, etc.

The firm of H. Ernest Redemann of Weil der Stadt (Kr. Leonberg), Max-Kasper-Strasse, are interested in obtaining U.K. agencies for plastics waste, paper wastes of all kinds, and accessories for the paper industry (felts and sifters). Founded in 1888 they are engaged in the import and export of textile waste, rags, and similar products and cover the whole of the federal republic of Germany, including West Berlin. Suppliers interested should write direct, also notify the British Consulate-General, Koenigstrasse 45, Stuttgart.

South Africa:
Worsted Piece Goods

Hartley and Woods (Pty.) Ltd., 45 Kruis Street, Johannesburg, would welcome a U.K. agency for worsted piece goods as follows—double plains and piece dyes within the price range 20s. to 23s. 6d. per yard ex-works. They cover the whole of the Union, having offices in Johannesburg and Cape Town and sub-agents in Natal and Port Elizabeth. Manufacturers interested should write direct, also notify the U.K. Trade Commissioner, P.O. Box 10101, Johannesburg.

Textile Trade and Prospects

Better Tone to Cotton Markets

The general tone in trading circles has been distinctly better in recent weeks and order books of many firms are in a healthier state than for some time. Four factors together have brought about a change in a situation which looked like persisting a long time. Mills closed, announcements of more closures, the concentration scheme and a more vigorous buying attitude stimulated by the possibilities of increased delivery times have culminated in this spurt of activity. Spinners report much more inquiry followed by, in many cases, some firm business covering almost every type, count and quality in yarns. Fair weights of standard weaving qualities have been booked on cop, cheese, hanks and ring-beams, and certain classes of hosiery qualities are in rather better request. The bulk of the orders have been for medium count twists and doubling wefts. Coarse yarns have been better supported and condenser types are being absorbed more quickly. Although the off-take of fine mule doubling wefts is still very poor, the weights sold seem to have been rather better in recent weeks; much more could be quickly produced even from the greatly reduced spindleage if the occasion arose. Novelty yarns—single and folded—are in good demand and the range of mule and ring spun blended types increases slowly. A slightly better tone has been noticed in one or two Continental markets. Higher weights have been booked but the total is still pathetically small compared with the buying potential if most of the uncertainties could be eliminated completely.

Movement of cloth on the home market has certainly been better despite the volume of imports from Hong Kong and India. A wide range of dress, etc., cloths have been booked and the orders have covered large proportions of cotton, rayon, etc., cloths in blended varieties, dobby and jacquard patterns, and screen and roller printed cloths in the medium price brackets. Apart from the better atmosphere now noticeable, it is at last beginning to dawn on some salesmen that their whole function is to sell—not merely to attend 'Change or make routine calls as the representatives of firms—and plaintively expect large orders to be stuck in their hands; nothing can be sold simply by dumb show and innocent appearance.

The demand for light furnishings—traditional and contemporary—in both printed and colour-woven designs has been encouraging. This also is a fine domestic market where price is the most important factor; considerably more would be bought by the public if distributive margins were not so unreasonably high. There is no excuse for cloths appearing in shops at three or more times the manufacturing price.

Household textiles are now selling better with the volume of quilts, sheets, cotton blankets, tablecloths, etc., higher than for the last three months. Hand and bath towels in imaginative designs are being taken up steadily and a good market exists for printed novelty wiping cloths in amusing designs and bright but simple colour contrasts. Packaged towel sets are also selling well. Wholesale stocks have been very effectively cleared and replacement buying is steady.

The off-take in most industrial cloths is not quite so good but a few good lines have gone through. There has been active support in certain export markets and New Zealand is now taking more interest in a few lines. North American and Continental markets are improving slightly, but most traders still view both of these in an apprehensive fashion. Total export business is still very unsatisfactory in volume and outlook.

Linen Trade Review

One by one old names disappear from the register of firms in the trade. Casualties, at first most evident in the weaving and finishing sections have, in recent months, taken toll of some long established spinning concerns, and the closing of Brookfield mill removes another long associated with the history of the trade. Even so, and despite temporary revivals, the downward trend of demand has not yet been matched by closures, and considerable surplus capacity remains.

There is much obsolete machinery in the trade and emphasis is rightly placed on the need for elimination, or replacement by modern plant where sustained demand can be envisaged. In some concerns there is also urgent need to overhaul the executive and technical question to eliminate non-qualified individuals who occupy directorships and managerial positions. The competitive position in world markets will not permit end costs to be burdened with the salaries of passengers neither ornamental nor useful.

There is considerable discussion on whether Government aid to cotton will affect the fortunes of the linen industry. Cotton is its chief competitor over the whole range of end-products, and the quality factor which formerly favoured linen in consumer estimation has been discounted to a large extent by the advent of man-made fibre materials, designed to specific end uses. Processing costs on the cotton system are considerably lower than those for linen yarn production, and recent modifications in machine design and manufacturing practice in the cotton industry have not been matched by improvements in linen manufacture with equivalent economic advantages. These could only be obtained by revolutionary changes in processing practice, which British manufacturers generally seem unwilling to accept.

The all-round improvement in demand, evident in late spring has been sustained, and yarn and cloth stocks mostly absorbed. Mills and factories generally are working for forward delivery but the position will not warrant bringing idle spindles and looms into production. The raw material position dominates planning at all stages of manufacture and contributes materially to the feeling of uncertainty prevalent today. This will continue just so long as the "tail wags the dog"—until the manufacturers take steps towards determining the source, quantity and quality of its raw material requirements. At present world prices are dominated by U.S.S.R. exports, which also indirectly force down the quality level of fibre produced in West European markets and limit the range of end products to the type of material available.

Reports from growing centres indicate that new crop is progressing favourably. Acreage figures are not available, but it is generally conceded that the total for West European countries will be substantially lower than that of 1958. With most labour diverted to retting and field work the amount of fibre on offer is small and quality on the whole, indifferent. Buyers have been more active recently and most material offered has changed hands at firm prices.

Establishment of Courtauld's rayon factory at Carrickfergus, the Chemstrand "Acrilan" factory at Coleraine, and the acquisition by I.C.I. Ltd., of a site at Carrickfergus for erection of a "Terylene" fibre plant, puts N. Ireland in the forefront of countries with an established man-made fibres industry. The adaptability of flax spinning machinery for processing man-made staples, and the possibilities offered for expansion and diversification of range of output with a relatively small capital outlay suggests a solution to many problems facing the N. Ireland linen industry, notably that of redundancy. Of even greater need than capital are men with new ideas on fabric design and structure, in which the specific characteristics of man-made fibre yarns produced on existing flax spinning machinery can be fully exploited.

The N. Ireland Minister of Commerce has stated that, during discussions with leaders of the linen industry the view was expressed that the most useful form of further Government assistance would be in the field of sales promotion. The Government had agreed in principle to continue financial support for a further period of three years, subject to adequate backing by the trade.

Wool Trade Activity and Prospects

Rates of wool consumption, top production and worsted yarn delivery in the U.K. in April continued to move upward. They were higher in March and considerably higher than in April, 1958. Compared with that month, wool consumption was 13% higher and top production 15% higher. In merino tops alone the increase was 23% but this was to some extent modified by a slight increase in crossbred

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top output, though the latter was higher than a month earlier. Worsted yarn delivery rates were 9% better than a year earlier. With wool fabrics the rate of delivery was 3% lower than in March but 4% higher than a year ago. Output figures for April were: wool consumption 46·25 million lbs. (clean); top production 31·30 million lbs.; tops drawn 19·63 million lbs.; worsted yarns delivered 20·00 million lbs.; woven wool fabrics delivered 29·59 million sq. yds.; blankets delivered 2·01 million sq. yds.

The current recovery of wool in the world's markets is to be supported by an intensification of wool promotion in many countries. This was one of the decisions announced by the executive of the International Wool Publicity and Research Fund, controlling the I.W.S., at the conclusion of their recent London meetings. A statement issued after the meeting said that full advantage of the present situation must be taken to strengthen wool's position, also that there was little doubt that wool was leading the recovery from the textile recession of 1958 in the majority of the main consuming countries. The Executive—which represents the growers of Australia, New Zealand and South Africa—while stressing the importance of wool in the economics of the Commonwealth countries concerned, pointed out that increased production had been accompanied by a widening of demand and increased consumption, particularly in the U.K., the U.S.A. and Japan. Research and technological advances had assisted wool to meet the challenge of the synthetics and the requirements of textiles in the modern world. It was forecast that the wool textile industries of the world would soon be employing new processes which would give wool additional advantages and answer the desire for "easy care" fabrics and clothes. As the three countries supplied more than 60% of the apparel wool of the world, these achievements would have far-reaching consequences. The activities of the I.W.S. were reviewed at the meetings and it was agreed that there should be a further extension of the funds provided for promotion and research throughout the world. It was also noted by the Executive that joint promotion campaigns with all sections of the wool textile industry had not only continued but increased, and they welcomed the inclusion of Austria for the first time in such partnerships.

Jute Fibre, Yarn and Prices

Raw jute has been quiet in Pakistan with a tendency for prices to ease. Offers of old and new crop have been more freely made but Dundee spinners show little interest. This is understandable because they have large quantities of raw material from the present crop. Registered sales to the U.K. since July 1 last year now amount to over 878,000 bales compared with 631,980 bales in 1957-58 and 733,506 bales in 1956-67. A fair quantity of new crop fibre has already been secured which will not be included in the above figures. Reports regarding new crop in Pakistan are satisfactory and this may be one reason for the easier trend in values.

Offers of old crop are £112 for Mill Firsts, £91 for Mill Lightnings, £80 for Mill Hearts and £65 for grade Hearts, c.i.f. U.K., June/July shipment. New crop is available at £109 Mill Firsts, £91 for Mill Lightnings and £80 for Mill Hearts c.i.f. U.K., Aug./Sept. for single marks but less would be accepted for groups. Dundee spinners show less interest in new crop white jute. A few offers of dark jute continue with Tossa-2/3 at £108 compared with £117 for old crop. However, there is not the discount available in the case of Tossa-4 with new crop at £95 and old at £96 10s. Prices of old and new crop must come eventually to the same levels and is noticed in the case of white jute. With the harvesting of dark jute taking place later in the season it may be some time yet until these values come to the same levels. Old crop crack Daisee-2/3 is offered at £94 and grade Daisee-2/3 at £86, c.i.f. U.K., June/July. Demand for raw jute from the Continent has been fairly steady and it is expected some countries still require to make substantial purchases from present crop. This should keep prices fairly steady until the end of the season. Pakistan mills have been in the market and this increasing consumption should keep prices firm. Internal consumption of raw jute in Pakistan is now greater than the U.K., and this increasing spinning capacity should counter-balance the decline in exports of raw material to India who, incidentally, is practically self-sufficient in raw jute supplies.

The Calcutta goods market has been fairly steady during the past month. There is a proposal that forward trading in jute goods in India should take place on a new contract under the auspices of the East India Jute and Hessian Exchange. The present system has been in force for futures trading in gunnies since March, 1958 but forward business was allowed to take place on the I.J.M.A. transferable specific delivery contract. This move should help to reduce speculation because both futures and forward trading will now be controlled by a single body. A new provision of the contract provides that the holder of a P.D.O. will be entitled to have a physical check on goods in a mill's godown against which it has been issued.

Demand from most consuming centres has been small but steady with quotations at 62s. for 10 oz. 40 ins., and at 46s. 6d. for 7¼ oz. with 11 oz. 45 ins. at 66s. per 100 yds. f.i.b. Calcutta for June shipment, at 61s. 6d., 46s. 3d. and 65s. 6d. respectively, July and at 61s. 3d., 46s. 3d. and 65s. 3d. respectively, August. "B" twills were quoted at 141s. 6d., June at 142s. July and at 142s. 3d. August. There has been little or no improvement in Demand for yarns and cloth in Dundee shows little improvement. Output has been reduced in certain instances and some producers are making considerable quantities both yarns and cloth for stock. Most materials can be obtained for early delivery and this is preventing consumers showing any interest in the forward position especially with the easier trend in raw material values. The carpet industry is also taking reduced deliveries of yarns and there are no signs of any improvement. The outlook for the jute industry is not bright at present but the usual seasonal demand should begin to show towards the end of the month.

Silk and Man-Made Fibres and Fabrics

Activity in both yarn and cloth production is now better than for the past three months. What the future holds of course, is anybody's guess but in Lancashire trading circles the warm, sunny weather has resulted in far greater interest in dress goods in cotton, rayon, nylon, etc., and mixtures in smart dobby and jacquard designs, and screen and roller printed cloths. Some beautiful all-filament cloths are now to be seen and many are viscose and acetate types at attractive prices coupled to short delivery dates. Spun novelties in both bright colours and pastel shades have aroused much more than casual interest amongst merchants and converters. Shirtings are in better demand at present and those incorporating the newer fibres in blends find ready outlets. Rayon sports' shirting is in good request and sales of most classes of dress goods and shirtings are higher than last year. Just how far the closure of mills in Lancashire will affect the off-take of filament and spun yarns remains to be seen. Many hope that higher activity in the running units will more than off-set the losses sustained in the shut-down mills.

Business in the Yorkshire trade is also brighter with steady interest in certain lines of woollen furnishings, incorporating varying proportions of "Terylene." There is a steady demand for ladies' all worsted and worsted blended suitings and costume cloths. Yarn producers report better demand from the Midlands and spun rayon and spun "Terylene" are two yarns at present in good request for half-hose manufacturers.

In the Midlands' area the percentage of seamfree hosiery to full-fashioned is believed to be very high at the moment, and may rise further in the near future. One advantage, of course, is price; some incline to the view that only in special cases will the expensive stocking return to favour. Men's and women's vests are in reasonable demand for the autumn and winter. Demand for double-jersey fabric appears slightly less probably as a result of the rather unusually good weather which has prevailed recently. The Nottingham lace trade is producing a wide range of traditional cotton laces and nylon and "Terylene" structures retain their popularity. Trade in the Macclesfield area is better for printers and in manufacturing circles a good range of tie fabrics and scarves, etc., have found good responses. Commission dyers and finishers report extremely competitive conditions for the available business. The newer fibres are prominent in the Leek trade specialities with "Courtelle" and "Acrilan" very prominent. Throwsters are quite active and a wide range of knitted goods are in keen request. Most classes of sewing threads are moving steadily with cotton, viscose, silk and nylon sharing a better market.

MECHANICAL HANDLING EQUIPMENT. Issued by a firm well-known for their wide range of equipment, the 174-page catalogue issued by G. Hunter (London) Ltd., 80 Fenchurch Street, London, E.C.3, must be one of the most comprehensive works on this subject. Profusely illustrated, with technical descriptions, specifications and prices, the publication covers cranes, hoists, lifting tackle, jacks, conveyors, stackers, fork-trucks, pallets and stillages. Valuable sections are also included concerning modernisation of dispatch bays, also instructions to be followed by those firms setting out to design their own gravity roller conveyors. It is an asset in any work's library.

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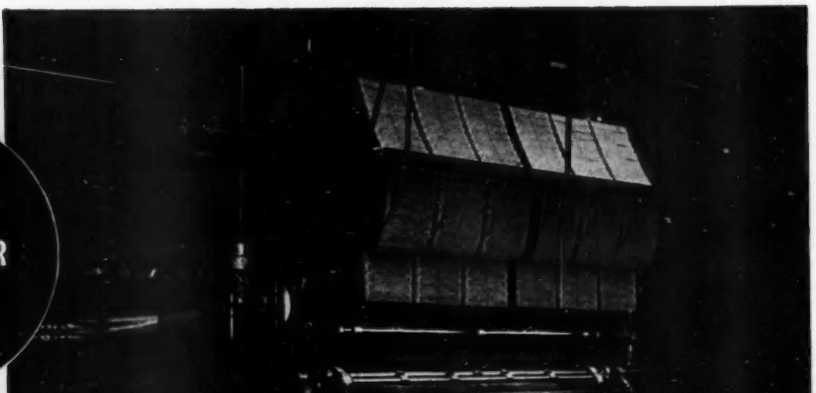

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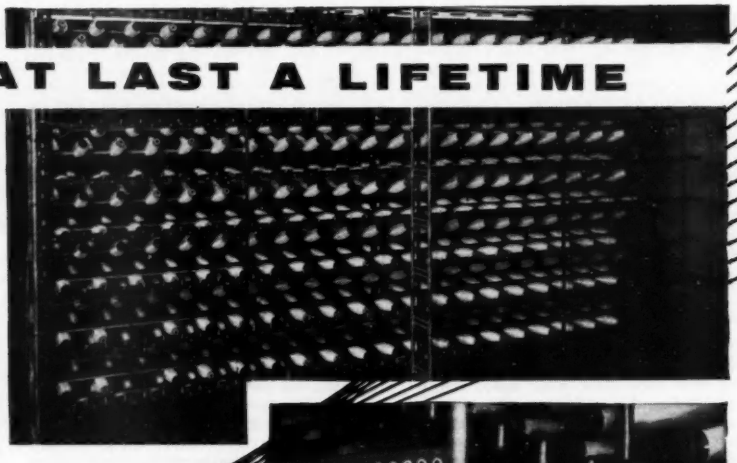

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Notes and News

Course on Quality Control

The College of Advanced Technology, Birmingham, is offering a full-time course of three weeks' duration on "Statistical Quality Control and Acceptance Sampling" to commence August 31, 1959. The course is primarily intended as an introduction to the subject. The first fortnight will be spent covering general principles and procedures of quality control. The final week will be devoted to lectures by specialists, and to visiting works employing quality control. The course will be directed by Dr. C. J. Anson (senior lecturer, Mathematics Department) and Mr. J. D. Morrison (senior lecturer, Production Engineering Department). Further details can be obtained from the Registrar, College of Advanced Technology, Gosta Green, Birmingham 4.

* * *

Russian Order for Scragg Machinery

A further order for textile machinery for Russia, worth approximately £600,000, has been obtained by the Scragg Group, Macclesfield. The order has been placed by Courtaulds Ltd. and is for machinery for the complete new acetate rayon plant for which Courtaulds have recently received a contract from Techmashimport in Moscow. This is in addition to the £1,000,000 worth of business with the Soviet Union that has already been announced by the Scragg Group in the past twelve months.

* * *

B.N.S. Doncaster Plant

British Nylon Spinners Ltd. announce that the short time working introduced during April as a temporary measure is ended. Prospects for nylon are considered to be encouraging. Manufacturers have cleared considerable stocks in recent weeks and export orders are better. The sale of nylon yarns for industrial textiles has reached a record level and demand for the apparel and household goods made from nylon is buoyant. Forward estimates indicate a heavy demand for yarns and staple.

* * *

Silk and Rayon Problems

Presenting the recent annual report of the Silk and Rayon Users' Association, Sir Ernest Goodale referred to the disappointment of the textile industry over the operation of the Anti-Dumping Act, which made it very difficult for the industry to establish a case or for the Board of Trade to take action. Other matters raised were the increasing collaboration within the textile industry and fresh developments in negotiations for an "Outer Seven" Free Trade Area.

At the annual luncheon which followed Mr. J. K. Vaughan-Morgan, the Minister of State, said it was encouraging to see that the export figures for April showed the best results since May 1957; exports to the U.S. were 38% higher in the first four months of this year than in 1958, and to Canada 8% higher.

With regard to Western Europe, the effects of the Common Market had yet to be felt, and it was possible that the impact of tariff changes might be less serious than quota discrimination. The Government's aim was still to come to some arrangement covering the O.E.E.C. countries but not inconsistent with O.E.E.C., although there was no prospect of an early reopening of seventeen-country negotiations on a fruitful basis. The Paymaster-General had made clear that countries outside the Common Market might have to consider how to break down trade barriers in Europe. Meanwhile, despite difficulties, it had to be kept firmly in mind that the overriding need for industry was to seek new ways to increase export trade. The industry represented by the Association had a background of quality—the tradition of silk and the skill needed to handle it, which had subsequently been used to pioneer the manipulation of new fibres as they appeared.

Sir Ernest Goodale, C.B.E., M.C., was re-elected president of the Association; Mr. P. B. Walters (Stephen Walters and Sons Ltd.) was re-elected chairman, and Mr. J. F. Sebire (Berisfords Ltd.) vice-chairman. Mr. W. R. Wadsworth, O.B.E., J.P. (Wm. Frost and Sons Ltd.) was re-elected honorary treasurer. New members elected to serve on the Council were: Mr. D. R. B. Mynors (Courtaulds Ltd.) in the Weavers' Section, Mr. W. Hawkins (Ford Ayrton and Co.) in the Silk Spinners' Section, and Mr. J. G. Green (Albert Green Ltd.) in the Ribbon Weavers' Section.

* * *

Textile Institute Honour

Mr. J. T. Marsh, J.P., M.Sc., F.R.I.C., F.T.I., F.S.D.C., has been elected an honorary life member of the Textile Institute. The pioneer work of Mr. Marsh and his colleagues on the application of resins to textiles is now world-famous, but he is also well-known for his contributions to textile education in the form of several reference books of textile chemistry. In addition, Mr. Marsh instituted the Dalton Lectures of the Royal Institute of Chemistry and the Mercer Lectures of the Society of Dyers and Colourists; he was also responsible for starting the "Review of Textile Progress."

* * *

Bobbins for Re-Winding or Re-Drawing

Barke Machinery Ltd., 100 Portland Street, Ashton-u.-Lyne, agents for Michele Ratti, Luino, Italy, in this country have reached an agreement with the bobbin-making firm of M. Scaglia, Milan, to handle the sales of their specially made bobbins for use on high speed re-winding and similar machines. Bobbins for use with nylon, "Terylene," acetate and other continuous filament yarns must be of the same high standard of strength and accuracy as the modern machines on which they are being wound and Scaglia have, it is stated, supplied all the bobbins for use on the large installation of Ratti machines at Soc. de la Viscose Suisse in Switzerland.

New Companies

Bradford Tufting Co. Ltd. Private. Reg. May 5. Capital £5,000 in £1 shares. Manufacturers, general merchants, distributors of wool, worsted, etc. Registered office: Oakwood Dye Works, City Road, Bradford.

Lufabrica Ltd. Private. Reg. May 7. Capital £1,000 in £1 shares. Dealers, merchants and manufacturers of textile fabrics, etc. Registered office: 1-3 St. Paul's Churchyard, E.C.4.

M. Swerling Ltd. Private. Reg. May 12. Capital £2,000 in £1 shares. Merchants, manufacturers and dealers in all kinds of cloth, etc. Registered office: 5 John Dalton Street, Manchester 2.

Univex Textiles Ltd. Private. Reg. May 12. Capital £1,000 in £1 shares. Manufacturers, importers, exporters and dealers in textile goods and fabrics, etc. The directors are: F. Klimt, 28 West Heath Gardens, N.W.3, and J. H. Lion, 9 Shawfield Street, S.W.3.

Wellgarth Textiles Ltd. Private. Reg. May 13. Capital £20,000 in 6,000 "A" shares of 10/- and 3,400 "B" shares of £5 each. Manufacturers, importers, exporters and dealers in textiles, etc. Solicitors: Lannons, 4 Copthall Buildings, E.C.2.

Shorn Wools Ltd. Private. Reg. May 14. Capital £50,000 in £1 shares. Wool tops, noils and waste merchants, etc. Registered office: Akam House, Sunbridge Road, Bradford 1 (P.O. Box 226).

Norafric Ltd. Private. Reg. May 14. Capital £500 in £1 shares. Importers, exporters and dealers wool, hair, cotton, silk and other fibrous substances, etc. Registered office: Beverley House, Little Horton Lane, Bradford.

Booth and Ward Ltd. Private. Reg. May 15. Capital £2,000 in £1 shares. Merchants, agents, exporters, importers, and dealers in wool tops, noils, waste, etc. Registered office: 8 Trinity Street, Trinity Road, Batley Carr, Dewsbury.

Elland Woven Fabrics Ltd. Private. Reg. May 19. Capital £500 in £1 shares. Wool merchants, etc. Registered office: 109 Elland Road, Leeds 11.

Winter Wools Ltd. Private. Reg. May 21. Capital £1,000 in £1 shares. Manufacturers of textile materials, etc. Registered office: 27 Ashwood Street, Bradford, 4.

Feltex Ltd. Private. Reg. April 30. Capital £10,000 in £1 shares. Carding, garnetting and similar processing of woollen, cotton and other fibres. Registered office: Victoria Mills, Liversedge, Yorks.

R. C. Dent, Sons and Co. Ltd. Private. Reg. April 30. Capital £20,000 in £1 shares. Wool noils and waste merchants, etc. Registered office: Manor Buildings, 2 Manor Row, Bradford 1.

L.R. (Wool Weavers) Ltd. Private. Reg. April 28. Capital £1,000 in £1 shares. Manufacturers and dealers in woollen and other cloths, etc. Registered office: 179 High Street, Bromley.

Shaftesbury Textiles Ltd. Private. Reg. April 30. Capital £500 in £1 shares. Manufacturers wholesale and retail dealers in lace embroidery, cloths and fabrics, etc. Registered office: 1 Bluecoat Street, Nottingham.

G. W. Smith (Honley) Ltd. Private. Reg. April 30. Capital £5,000 in £1 shares. Dealers in cottons, woollens, worsted, plush, satin, velvet and other textiles and fabrics, etc. Registered office: Bradshaw Mills, Honley, near Huddersfield.

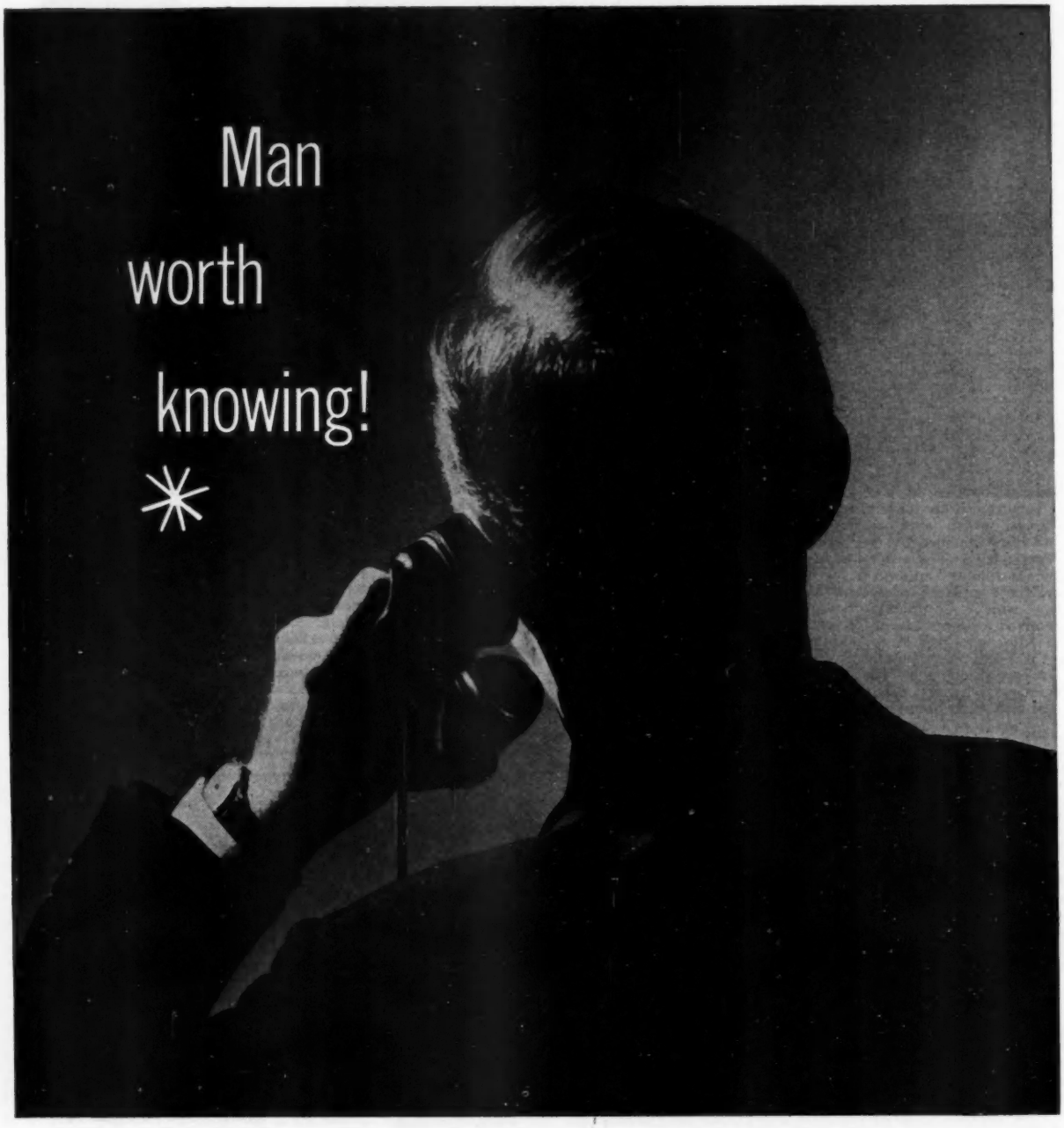
Northern Linen Company (Belfast) Ltd. Private. Reg. in Belfast February 19. Capital £30,000 in £1 shares. Linen merchants. The directors are: Nathaniel G. Matthews, 25 Farnham Road, Bangor, and Frank Cleland, 9 Donegall Square South, Belfast.

Ralph Hardaker (1959) Ltd. Private. Reg. April 24. Capital £5,000 in £1 shares. Textile merchants and manufacturers, etc. Solicitors: Firth and Firth, Bradford.

William Laycock and Son (Manufactursre) Ltd. Private. Reg. April 24. Capital £20,000 in £1 shares. Textile merchants and manufacturers etc. Registered office: 4-6 Burnett Street, Bradford.

Festivals of Films for Industry Ltd. Reg. April 24. Five hundred members, each being liable for £1. Objects: to promote the study of how film can best be used in the service of industry and commerce, and in particular to promote festivals at which ideas and experience in this connection can be exchanged, etc. Solicitors: Slaughter and May, 18 Austin Friars, E.C.2.

Lauderwood Ltd. Private. Reg. March 16. Capital £1,000 in £1 shares. Manufacturers, weavers and merchants of ties, and cloth, etc. Registered office: Harryburn House, Lauder, Berwickshire.



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Tufting Penetrates Iron Curtain

As reported from time to time technical delegations from the U.S.S.R., sponsored by the Cobble Organisation, have visited tufting plants in this country and the U.S.A. Apparently these visitors were considerably impressed by the advantages of the tufting technique of carpet manufacture since a contract has now been signed in Moscow between Techno-proimport and the Cobble Organisation for the supply of a considerable number of tufting machines, some equipped with the latest Cobble pattern attachments. The immense capital outlay shows clearly that tufting will soon be making a big impact in the Soviet Union and the satellite countries.

* * *

Candlewick, etc., Machines

Cobble Brothers Machinery Co. Ltd. have formed an agreement with Broad Street Machine Co. Inc., Broad Street, Chattanooga, Tennessee, U.S.A., whereby Cobble Brothers will sell the Broad Street range of machinery for the U.K. and continental Europe. Broad Street Machine Co. are well known for their single-needle and multi-needle table machines for the candlewick and carpet industry and, in addition, specialise in flower machines, circle and scroll machines, long-loop and long cut-pile machines for producing rugs. All inquiries should be addressed to Gate Street Works, Blackburn.

* * *

Benninger Centenary

Representatives of the Swiss Federal Government, together with agents from practically every major textile producing country of the world, were present recently at the celebrations to mark the centenary of the Benninger Engineering Co. in Uzwil, Switzerland.

Starting originally as loom builders, the company expanded its activities to include dyeing, finishing and warping equipment and so great was the eventual expansion that Benninger have transferred their loom building activities to a new factory in Como, Italy, where they acquired the loom business of Omita.

This expansion followed the many technical developments introduced by the firm, among which were the automatic dye jig; the automatic non-stop four-colour shuttle changing loom and—more recently—the pressurised dye jig for synthetic fabrics; continuous washing, dyeing and bleaching machines and the ZA section warping machine.

Home-Market Promotion for British Wool Textiles

The Wool Textile Delegation has invited firms in the wool industry to co-operate in financing a voluntary scheme for immediate home market promotion of British wool textiles.

Federated and non-federated firms have been asked:—

(1) Are you in favour of a promotion scheme aimed at increasing the sale of all the industry's products in the home market?

(2) If yes, would you be prepared to contribute towards such a scheme by entering voluntarily for a period of not less than three years into a contractual agreement for the contribution of a yearly sum?

It is still considered desirable by the delegation that the scheme should be based on a statutory levy on the industry for reasons of equity and ensuring a steady income. At the moment, however, despite increasing support in the industry, the high degree of agreement necessary for an approach to the Government for a statutory levy has not yet been achieved.

Meanwhile, as considerable time would necessarily be involved in parliamentary procedure to secure a statutory levy, and having regard to the general urgency for a home-market promotion campaign, the industry is being invited to declare in favour of a 3 to 5 years' scheme based on voluntary support. The annual sum it is hoped to raise from the industry by voluntary means is in the region of £250,000.

* * *

Man-Made Fibres

Production of man-made fibres in May was 38·5 million lbs., compared with 36·87 million lbs. in April, and 36·17 million lbs. in May last year. There was a minor decrease in continuous filament yarns, the May figure being 18·51 million lbs., compared with 18·63 million lbs. in April, but showing a healthy increase compared with 1958, when the May total was only 16·52 million lbs. Staple production in May was 20·00 million lbs., compared with 18·24 million lbs. in April and 19·65 million lbs. in May last year. Perhaps the biggest influence in the staple section has been the well sustained demand for crimped rayon staple for carpets and candlewick bedspreads, while spun-dyed staple demand has kept up particularly well. Some easing off in nylon filament yarn output doubtless contributed to the slight decline in filament yarn production, though since then there has been a marked improvement in bookings of nylon yarns. Business in filament acetate and triacetate yarns has been particularly brisk during June.

* * *

Non-Woven Fabrics to be made in Australia

Lantor Ltd., associate company of Tootal Ltd. and the West Point Manufacturing Company of Georgia, U.S.A., are to set up a plant to manufacture these interlinings in Australia. Lantor, who will now be able to produce goods especially for Australian requirements, will be setting up a company, Lantor of Australia Pty. Ltd. The machinery is being erected now and production will commence in Oct./Nov. this year.

* * *

Sales Plan for Lantor

Henry Marriott and Co. Ltd., Albert Square, Manchester, have been appointed sole representatives for the sale of Lantor fabrics to wholesale manufacturers of men's clothing in Great Britain. These non-woven interlinings are manufactured by Lantor Ltd., an associate of Tootal Ltd. and West Point Manufacturing Co., Georgia, U.S.A.

* * *

U.K. Wool and Top Stocks

Total stocks of wool in the U.K. at April 30 are estimated by the Wool Industry Bureau of Statistics at 266·6 million lbs. (clean), made up of 110·0 million lbs. merino and 156·6 million lbs. other sorts. The total is 4·4 million lbs. higher than at the end of March and 22·7 million lbs. higher than the relatively low stock held at April a year ago. Wool top stocks at April 30 were 65·5 million lbs., some 3 million lbs. higher than at the end of March and 14·2 million lbs. higher than a year earlier.

* * *

Packaging Materials

British Celanese Ltd. will be showing on their stand in the Packaging Exhibition at Olympia, September 8-18, the wide range of plastic materials they produce for packaging. Most important of these is cellulose acetate in sheet and film form, sold under the trade-names "Cellastine," "Clarifoil" and "Celawrap." Uses include vacuum-formed blister packs, laminated packs and sachets, rigid boxes, window cartons, tubular packs, and food-wrapping. "Celatron" high impact styrene sheet will also be shown as vacuum-formed box liners, pack bases, containers, etc. On the "Celanese" stand will also be shown a number of new plastic materials which are expected to find considerable application in the packaging field.

* * *

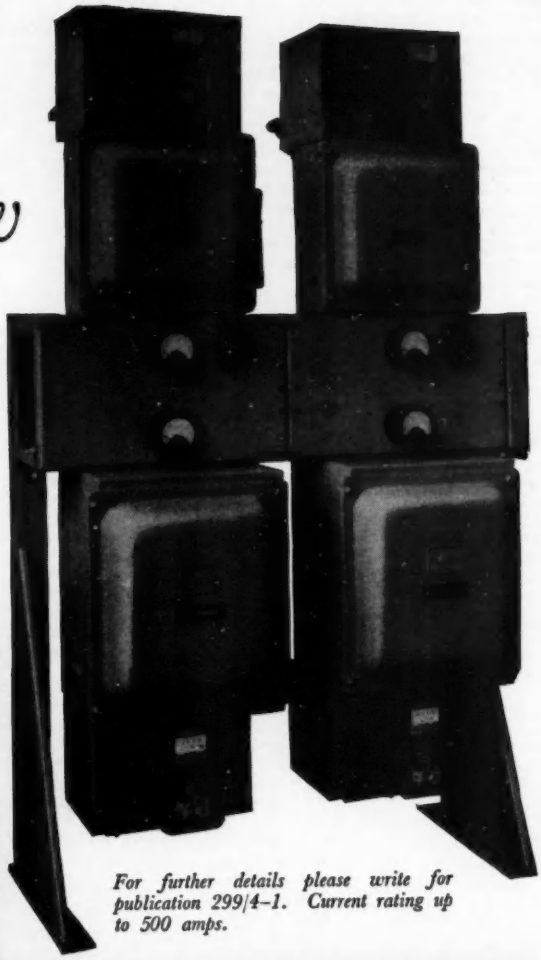
New Dye for Printing

The new Procion Orange Brown HG, recently announced by I.C.I. Ltd., is an orange brown of good light and wet fastness expected to find its main value in textile printing. The printing recipe for cellulosic fibres and natural silk follows the established pattern, incorporating urea (10 - 15%) and sodium bicarbonate (1·5 - 3·0%), depending on the percentage of dye, together with a small amount of Resist Salt L to ensure development of correct shade. Procion Orange Brown HG is also suitable for printing chlorinated wool.

Mr. Werner Vogt (managing director, Benninger Engineering Co. Ltd.) receiving a bouquet from one of the staff at the centenary celebrations

This unit will grow

These Type MC distribution switchboards are easily and quickly installed, boards being built up on site from stocked components, and can be extended without limit to the number of circuits. One of the features of these switchboards is the unit construction of the busbar chambers, which are made to suit the several sizes of fuse-switch.



For further details please write for publication 299/4–1. Current rating up to 500 amps.

Associated Electrical Industries Limited
SWITCHGEAR DIVISION
Trafford Park, Manchester · Higher Openshaw, Manchester · Willesden, London

RECENT TEXTILE PATENTS

These abridgements are republished from specifications by permission of the Controller of H.M. Stationery Office. The full specifications can be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2. Price 3s. each.

796,885 Telescopic Yarn Package Supports

PRINCE-SMITH AND STELLS LTD., *Burlington Shed, Keighley.*

A "telescopically" extensible and contractible package support comprises an outer tubular member and an inner member that is slidable within the bore of the outer member. The bore of the outer member is of uniform cross-section throughout the major part of the length, but tapers to a smaller cross-section progressively near and towards one end. The exterior of the inner member is, throughout the major portion of its length, not greater in cross-section than the smaller terminal cross-section of the bore of the outer member but, at the end opposite to the tapered end of the bore of the outer member, flares out to a terminal cross-section not greater than, and preferably equal to that of the major part of the bore of the outer member.

797,135 Pile Fabrics

BRITISH CELANESE LTD., *London.*

Manufacture of pile fabrics in which the pile consists of, or contains short lengths of twisted yarn made up at least in part of artificial fibres in which the twist has been set by increasing the degree of crystallinity of the material of the artificial fibres. In one example, melt spun cellulose acetate yarns of filament deniers 10, 15 and 25 respectively were made by the methods described in B.P. Nos. 719,853 and 748,772) and were cut into staple lengths and spun by the woollen system into a yarn of 3,200 denier with a twist of 2·5 turns per inch. Two ends were then doubled, with a twist of 4 turns per inch in the opposite direction, to give a carpet yarn of 6,400 denier. In each instance, part of this yarn was used to form the pile of a Wilton-type carpet, which was subsequently heated to 212°C. for 3 mins. by contact of the pile with a heated metal plate. Another part was heated to the same temperature and for the same time before being used to form the pile in a similar carpet. In both cases the pile was characterised by a high degree of springiness and resilience, and a somewhat harsh handle. The handle could be softened however by brushing the pile or, when the yarn was given the heat treatment before being formed into the pile, by passing it under tension through an angle of 160° round a smooth steel bar of ¼ in. diameter.

797,680 Cotton Opener Cylinder

J. LIGHTHILL, 57 *All Saints Road, Lytham St. Annes.*

An improved construction of cylinder for opening machines which will tend to prevent accumulation of fibres between the ends of the cylinders and the walls of the chamber through which the cylinder shafts pass to their supporting bearings. For this purpose agitator blades are provided at the ends of the cylinders so as to rotate in close proximity to the side walls of the chamber.

797,817 Warp Knitting Machinery

F.N.F. MACHINERY MANUFACTURING CO. LTD., *Burton-on-Trent, Staffordshire.*

A flat warp knitting machine has the threads laid into the hooks of a row of reciprocating needles by warp guides and has sinker nebs for holding down the knitted loops, which move transversely to the row of needles and into and out of engagement between the parts of the threads extending between the guides and the needles. The guides are moved to and fro to the row of needles twice during each complete cycle of movement of the needles and are caused to make lapping and shogging movements along the row of needles during the time that the guides are in front of the needles, and the sinker nebs are in engagement between the warp threads.

797,916 Top Draft Roller Weighting

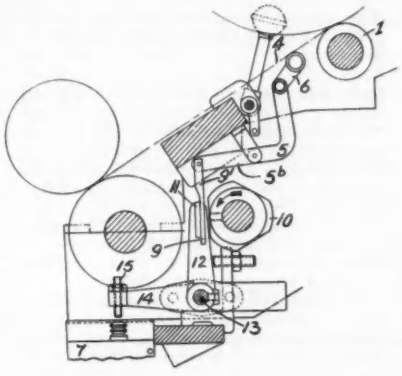
SKF KUGELLAGERFABRIKEN GESELLSCHAFT MIT BESCHRANKTER HAFTUNG, 13 *Ernst Sachs Strasse, Schweinfurt am Main, Germany.*

A drafting mechanism comprises a weighting arm which carries the top rolls and can be raised about its pivot. The pivotted arm can be retained in operating position by means of a catch having an operating member. As a result of movement of the operating member at least one resilient member of the catch mechanism has load applied to it, and the catch mechanism is moved into its locking position or into its released position according to the position of the operating member.

797,924 Jute Drawframe Stop-Motions

JAMES F. LOW AND CO. LTD., *Monifieth Foundry, Monifieth, Angus, Scotland.*

In a stop-motion for jute drawframes the detector palm 6 bears against the sliver 4 delivered by the front roller 1, and if the sliver breaks or if the tension is reduced, the palm swings upwards. The arm 5*b* of cranked lever 5 swings down causing the wedge 9¹ of the cam follower 9 to enter the operative field of the cam 10. Rotation of the cam 10 forces the wedge against the abutment 11 so that the lever 12 rocks the shaft 13 through an arc sufficient to swing the lever 14 and associated contactor 15 down to engage the microswitch 7 and to stop operation of the frame. When the detector palm bears against the sliver, only the lower end portion of follower 9 is in the operative field of cam. The dimensions of the lower end portion of the follower are such that, while rotation of the cam effects rocking movement of shaft 13, the shaft is only rocked through an arc which is insufficient to cause effective engagement of the contactor 15 with the switch.



798,014 Automatic Weighing and Fibre Feeding

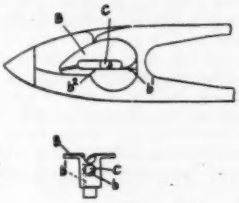
T.M.M. (RESEARCH) LTD., *Hartford Works, Oldham.*

An automatic weighing and feeding machine comprises means for reducing the rate of feed of material to the scale pan during the latter part of the feeding operation for each weigh, as the weight of the pan contents approaches the desired value for discharge. The feeding mechanism includes two alternative gear-trains respectively selected by the operation of an electro-magnetic double clutch, the windings of which are energised through switches controlled by the movement of a weigh beam associated with the scale pan. A high-speed gear train is engaged by the clutch for the initial part of the weighing operation, and the tilting of the beam consequent when approaching the desired total weight is effective to disengage the high-speed gear-train and engage a low-speed gear-train so as to continue the feed at a "trickle" rate. A rotary brush delivers the material to the scale pan in a continuous stream.

798,098 Ball Tension in Shuttles

H. HEAP, 13 *Tonacliffe Terrace, Whitworth, Rochdale,* and F. WILKINSON.

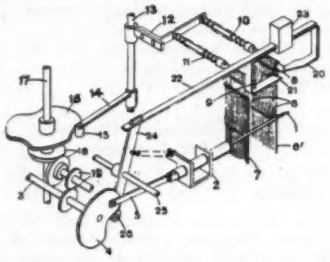
A shuttle is provided with a self-threading device B. A ball C is inserted into the bore *b* in the threading device



through which the yarn passes from the pirn to the shuttle eye *a* the weight of the ball applying tension to the yarn. The ball is prevented from escaping from the bore at either end by pins b^1, b^2 inserted into bores in the device when the ball is in position.

798,232 Automatic Warp Drawing-in
ZELLWEGER LTD., *Uster, Zurich, Switzerland.*

Improved apparatus for automatically supplying warp thread heddling machines with single healds. A heddle hook 1 has a thickened portion mounted in a guideway 2. A shaft 3 makes one revolution for each thread to be heddled and carries a cam 4 which serves as a crank for a rod 5 which reciprocates the hook. When the hook moves forward, its pointed end passes through the heald eye of a heald 6^1, and then engages a warp thread (not shown) which is drawn through the eye of the heald, during the return movement of the hook. The healds are arranged in a magazine in two rows 6 and 7 with their suspension eyes on pairs of bars 8 and 9, and are urged by compression springs 10 and 11 along the bars. The bars 8 and 9 are carried on a frame 12 which is adapted



to rock about a vertical pivot 13, the rocking movement being effected by movement of a lever 14 carrying a cam-follower roller 15 which engages a cam 16. The cam is mounted on a shaft 17, which is driven through bevel gears 18 and spur gears 19. The gears and the profile of the cam are so related that the frame 12 rocks in such manner, that the forward ends of the bars 9 or 8 arrive in the position necessary for dividing the foremost heald in a predetermined sequence. The dividing device comprises a dividing blade 20 and a retainer 21 both of which are fixed on a rail 22 guided in a mounting 23. Rod 22 can be displaced by a lever 24, which is mounted on a shaft 25 and is rocked by means of a cam follower 26 co-operating with cam 4. The blade 20 separates the foremost heald from one of the rows 6 or 7 each time the lever 24 is rocked in one direction, and when the lever returns to its original position the other healds are kept back, against the pressure of the compression springs 10 and 11, by the retainer 21.

798,328 Controlling Card Feed
VYZKUMNY USTAV TVARECICH STROJU A TECHNOLOGIE TVARENI, 14 *Smeralova, Brno, Czechoslovakia.*

A feeder for a carding machine comprises an endless spiked lattice provided with a drive and with a control device for controlling the rate of delivery of fibres. The drive for the spiked lattice includes a clutch and that the control device is constructed to engage and to disengage the clutch at regular intervals, the ratio between the duration of engaged condition and of the disengaged condition being adjustable.

798,345 Bobbin-Changing on Double-Shuttle Looms
GEORGE FISCHER AKT. GES., *Schaffhausen, Switzerland.*

A mechanism for changing weft bobbins in a loom having two shuttles arranged to be picked simultaneously through superposed warp sheds. Two shuttle boxes are arranged for reciprocatory movement and independently of one another, to and from locations where they lie beneath the outlet from a bobbin magazine. Feeler means are provided for exploring each bobbin in order to ascertain when the bobbin has been unwound as far as its thread reserve, this means being associated with actuating means for moving the shuttle boxes, the actuating means being movable by apparatus mounted on the crankshaft of the loom. Means are also provided for raising the magazine in a vertical direction from a position where it can discharge into the lower shuttle box, to a position where it can discharge into the upper shuttle box. When a bobbin has been unwound as far as its thread reserve, the feeler means initiates movement of the actuating means, which are then moved by the device on the crank shaft, and which move a shuttle box to the location where it lies beneath the outlet from the bobbin magazine. A full bobbin then enters the shuttle box and displaces the spent bobbin out of the box. The means for raising the magazine only operates when the bobbin in the upper shuttle box is to be changed.

798,593 Scouring Flax or Hemp Fibre
MONTECATINI SOCIETA GENERALE PER L'INDUSTRIA MINERARIA E CHIMICA, *of* 18 *Via Filippo Turati, Milan, Italy.*

A process for scouring flax or hemp comprises treating with a solution containing (*a*) an alkali metal sulphite, (*b*) a neutral alkali metal phosphate or pyrophosphate and (*c*) an alkali metal hydrosulphite or formaldehyde sulphoxylate. In one example 100 kg. of flax or hemp yarn are treated at 90°C. for 1 hour with 600 litres of a solution containing:—

Neutral sodium pyrophosphate	g/l 5
Anhydrous sodium sulphite	g/l 5
Sodium hydrosulphite	g/l 4

After the treatment the yarn (95 kg.) is washed and then treated for 1 hour at 90°C. with 1,000 litres of a solution containing:—

130-vol. H_2O_2	kg. 15
Sodium silicate	kg. 20

After this treatment and washing, the yarn shows a degree of whiteness which is good for the hemp and excellent for the flax. The bleaching solution can be re-used for bleaching further yarn after replenishment of the H_2O_2 consumed.

798,634 Felting Articles from Fibres and/or Filaments
HAWLEY PRODUCTS CO., *St. Charles, Illinois, U.S.A.,*

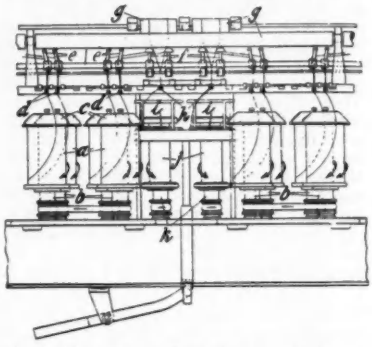
A new and improved felting apparatus especially for making felted contoured preforms from fibres and filaments, including cellulose, nylon, glass filaments, etc. The process comprises moving a porous felter through a slurry of liquid containing dispersed fibre felted. The volume of the body of liquid is maintained constant and the liquid is confined so that the liquid in the path of the felter passes through the felter and not around it. The felting is attributable solely to the pressure of the liquid and the suction effect created by the passage of the liquid through the felter.

798,711 Automatic Bobbin-Changing Mechanism
MASCHINENFABRIK RUTI AG. *vormals Caspar Honegger, Ruti, Zurich.*

An automatic bobbin-changing mechanism for looms has at least two separate bobbin supply ways which open into a common channel leading to the bobbin-changing position. The supply ways are arranged to receive bobbins from magazines which are each shaped to hold a single row of fully wound bobbins and adapted for connection with the supply ways to permit individual removal and exchange of the magazines.

798,955 Tyre Cord Machines
ARUNDEL, COULTHARD AND CO. LTD., *Sovereign Works, Stockport.*

A machine for the production of tyre cord, etc., and is an improvement on B.P. No. 745,598. The single yarn bobbins *a* is uptwisted so that additional twist is imparted to the yarn, the latter passing through flyers *c* and lappet guides *d*, around guide pegs *e* and *f*, around delivery rollers *g*, through lappet guides *h*, through travellers on the rings *i* and on to



the bobbins *j* on the twisting spindles *k*. Each spindle *k* co-operates with two uptwisting spindles *b*, and that one of such pair is not in the general line of the spindles at opposite sides of the machine but is in front of its co-operating spindle but slightly to one side of it. By this arrangement, it is possible to obtain a greater productive capacity in a certain length of machine.

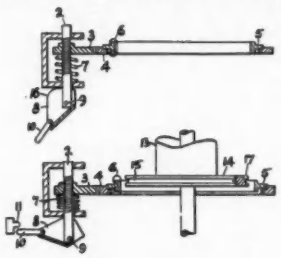
798,990 Dyeing Yarn, etc., in Closed Circuit System
P. SERRACANT RIBA, *Colon No.* 40, *Sabadell, Barcelona, Spain.*

An apparatus for the treatment of hanks, etc., with a liquid circulating in a closed circuit, has an autoclave vessel having a closure at one of its ends for charging it with material, and having a central tube mounted in such a manner that the material can be placed around it. The vessel is provided with hollow trunnions that define a perpendicular axis of rotation with means for revolving the vessel around this axis during the treatment of the material. The hollow trunnions communicate with means for inlet and outlet of the liquid and with conduits which open at the end of the vessel opposite the closure. One of the conduits opens into the interior of the central tube of the vessel and the other conduit inside the vessel, so that a continuous path is provided for the liquid from one of the trunnions, through one of the external conduits, the central tube, the material and the other external conduit and thence to the other trunnion.

799,133 Ring Spinning and Twisting Machines
COURTAULDS LTD., 16 *St. Martin's-le-Grand, London*

Improved ring spinning and twisting machines, particularly for the winding of transfer tails on the yarn packages.

The ring 5 on which is mounted a traveller 6 is carried in a ring holder 4 which is pivoted to a rail 3. The rail is supported on a plunger 2 which may be reciprocated by a mechanism which is not shown. A cam 8 embraces the lower end of the plunger to which it is pivoted by the pin 9, and an arm 10 is pivoted to the cam. In Fig. 1, the cam is shown in position for normal winding in which the ring is supported by the spring 7 in its normal position determined by the cam, and in this position yarn is wound on the barrel 13 of the bobbin. To lower the ring so that yarn is wound in the groove 15 on the flange 14 of the bobbin to form a tail, the

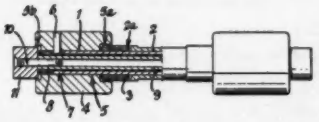


upper end of plunger 2 is pushed down, whereupon the cam turns under its own weight into the position shown in Fig. 2. The face 16 of the cam abuts on the underside of the ring rail to hold the ring down. As winding proceeds, the ring at the bottom of its traverse stroke reaches the position shown in Fig. 2, and the yarn is wound into the groove 15. As the ring rail approaches its lowermost position, the arm 10 encounters a projection 11, and the arm is pivoted so that it may turn upwards, and thus it moves past the projection 11 without effecting the position of the cam. On the subsequent upward stroke, the arm 10 engages the underside of the stop and as it cannot turn downward relative to the cam beyond the position shown, the cam 8 is turned into its original position shown in Fig. 1, and the spring 7 raises the ring to its original position.

799,248 Dual-Boss Top Rollers

CASABLANCAS HIGH DRAFT CO. LTD., *Bolton Street, Salford* 3.

A dual-boss top drafting roller has an arbor 1 in the form of a tube on which is a sleeve 2 having an enlargement 2*a* at each end for the reception, of sintered metal bush bearings 3. The ends of the arbor project from the sleeve and on each end

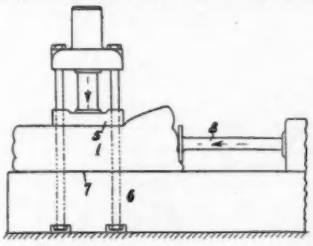


is mounted a roller boss 4. Opposite ends of the boss bore 5 are enlarged at 5*a* and 5*b*, the enlargement 5*a* being arranged to fit over the enlarged end 2*a* of the sleeve. The length of the arbor is such that, when the boss is correctly positioned on the arbor end, the latter terminates short of the enlargement 5*b*. The boss is locked on the arbor against relative rotation by a pin 6 which projects through the boss to engage in one of a pair of opposed open slots 7 formed in the arbor. Secured in the outer end of the bore 5 is a bearing bush 8 the inner end of which adjoins the extremity of the arbor end within the boss, whilst the outer bush end projects slightly into the enlargement 5*b*. To provide the roller with end pivots, a carrier 9 in the form of an inner tube is located within the arbor, the length of the tube being such that each end projects through and slightly beyond the bush 8. The ends of the tube are each internally secured to the tapped tube ends, by means of screws 10, and cylindrical axially tapped blocks 11 form the end pivots for the roller.

799,300 Disintegrating Hard Pressed Fibre Bales

DOUGLAS FRASER AND SONS LTD., *Westburn Foundry, Arbroath, Scotland.*

A method of disintegrating bales of hard pressed fibrous material. 3 3*a*, 3*b* denote three pairs of spaced fluted rollers arranged in tandem and the gaps between the pairs of rollers decrease in the direction away from the direction of feed of the bale 1. The gap between the first pair of rollers 3 is less than the cross-dimensions of a bale 1 passing between the rollers but is large enough to permit the rollers to grip the



bale when the bale is fed to the rollers from a conveyor 4. 5 denotes a platen incorporated in a press 6 and movable towards and away from a bed-plate 7 adapted to support the bale. 8 denotes a ram adapted to feed the bale intermittently between strokes of the platen 5.

799,438 Extracting Liquid from Fibrous Materials

SANDERSON AND MURRAY LTD., 1 *Wilderhaugh, Galashiels, Scotland,* and M. W. DAVIDSON.

Apparatus for the extraction of water from a mass of washed material such as fibres. The method consists in conveying the material to a position below a deflated flexible bag, admitting fluid under pressure to the bag to inflate it and to urge a part of the outer face of the bag into contact with the material so that this part is free to expand radially and is tensioned uniformly to conform readily to the configuration of the material by the pressure of the fluid which acts on the unrestrained lateral side of the bag. The bag is deflated following the extraction of the liquid, and the material is conveyed intermittently to a position below the bag and then conveyed to a position beyond the bag.

799,451 Raising Machines

ETABLISSEMENTS ALBERT C. SCHOLAERT, *Rue Monge, Tourcoing (Nord), France.*

A worker roller nap raising machine has a first variable speed drive for adjusting the speed of the fabric, a second variable speed drive for adjusting the speed of the worker rollers and a device for adjusting and permanently indicating the "intensity of scratching." This device includes: a stationary support, a first element movable with respect to the support and connected to the control member of the first variable speed drive by a connection designed so that the distance of the first element from an original position at any moment is proportional to the travelling speed of the fabric. A second element movable with respect to the support is connected to the control member of the second variable speed drive by a connection so designed that the distance of the second element from an original position at any moment is proportional to the increase or the decrease in the speed of the worker rollers. Both mentioned distances are measured in the same direction and the relative position of both the movable elements are indicated by a graduation which indicates the intensity of scratching.

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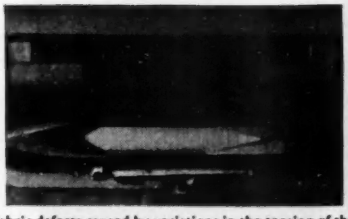
Weft Tension



Fabric defects caused by variations in the tension of the weft during weaving can frequently be avoided by measuring the unwinding tension on a "SHIRLEY" Weft Unwinding Tension Meter. By using this robust instrument the tension of the weft can be measured as it is withdrawn from the shuttle; the effect on the tension can be assessed of varying shapes of pirn, linings, etc.

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